MYCOPATHOLOGIA
ET
MYCOLOGIA APPLICATA

FUNDATORES:
R. CIFERRI
P. REDAELLI

EDENDA CURAVIT:
TIBOR BENEDEK
Chicago, Ill.

EDITORES:

F. de Almeida, São Paulo — A. E. de Arêa Leão, Rio de Janeiro — A. Azzi, Torino — E. Baldacci, Milano — J. Bánhegyi, Budapest — E. Baudys, Brno — K. B. Boedijn, The Hague — S. R. Bose, Calcutta — Wm. Bridge Cooke, Cincinnati, Ohio — F. T. Brooks, Cambridge — H. Campins, Barquisimeto, Venezuela — A. L. Carrión, San Juan, P. R. — A. Castellani, Lisboa — E. Castellani, Sassari — A. Catanei, Alger — K. Cejp, Praha — A. Chaves Batista, Pernambuco — A. Ciccarone, Roma — N. F. Conant, Durham, N. C. — J. N. Couch, Chapel Hill, N.C. — J. Coudert, Lyon — S. N. Dasgupta, Lucknow — E. D. Delamater, Philadelphia — C. W. Dodge, St. Louis, Mo. — C. W. Emmons, Washington, D.C. — G. Falchi, Pavia — E. Fejér, Budapest — G. W. Fischer, Pullman, Wash. — G. Florenzano, Firenze — A. da Fonseca, Rio de Janeiro — N. Fries, Uppsala — A. Gonzalez Ochoa, Mexico, D.F. — H. Götz, München — L. Grigoraki, Marseille — E. I. Grin, Sarajevo — E. Hazen, Albany N.Y. — T. Hemmi, Kyoto — S. Ito, Sapporo — D. Janke, Marburg/Lahn — J. Jørstad, Oslo — F. D. Kern, State College, Pa. — A. M. Kligman, Philadelphia, Pa. — C. da Silva Lacaz, São Paulo — J. Lodder, Delft — J. E. Mackinnon, Montevideo — O. de Magalhaes, Belo Horizonte — A. v. Mallinkrodt-Haupt, Köln — P. Martens, Louvain — D. S. Martin, Durham, N.C. — J. Meyer, Strasbourg — M. Pereiro Miguens, Santiago de Compostela — J. H. Miller, Athens Ga. — R. Morquer, Toulouse — E. M. Mrak, Berkeley, Calif. — J. A. Nannfeldt, Upsala — P. Negroni, Buenos Aires — W. J. Nickerson, New Brunswick, N.J. — F. L. Niño, Buenos Aires — J. Obrtel, Praha — T. Ørskov, København — Pereira Filho, Porto Alegre — A. Pijper, Pretoria — A. Pilat, Praha — A. Pinto Viegas, Campinas — B. Peyronel, Torino — J. Politis, Athènes — G. Pollacci Pavia — V. Puntoni, Roma — T. Rayss, Jerusalem — I. Reichert, Rehovot — F. Reiss, New York — E. Rivalier, Paris — P. Rogers, New York — K. Sakaguchi, Tokyo — R. Sartory, Strasbourg — G. H. Scherr, Chicago — J. Schwarz, Cincinnati — F. J. Seaver, Winter Parc, Fla. — G. Ségretain, Paris — R. Singer, Tucuman — A. H. Smith, Ann Arbor, Mich. — F. K. Sparrow, Ann Arbor, Mich. — J. A. Stevenson, Beltsville, Md. — Y. Takahashi, Sendai — R. V. Talice, Montevideo — M. J. Thirumalachar, Pimpri, Poona — A. Trotter, Portici — A. C. Ukil, Calcutta — R. Vanbreuseghem, Anvers — C. Vermeil, Tunis — O. Verona, Pisa — S. A. Waksman, New Brunswick, N. J. — J. Walker, London — L. E. Wehmeyer, Ann Arbor, Mich. — R. G. Werner, Nancy — J. Westerdijk, Baarn.

VOLUMEN IX

UITGEVERIJ Dr. W. JUNK — DEN HAAG — 1958

VOLUMEN IX

Fasc. 1. (pag. 1—96) edit.: 15—III—1958
Fasc. 2. (pag. 97—188) edit.: 2—VI—1958
Fasc. 3. (pag. 189—260) edit.: 15—VIII—1958
Fasc. 4. (pag. 261—372) edit.: 29—IX—1958

INDEX AUTORUM

Alteras, I., 288.
Ames, R. W., 261.
Andleigh, H. S., 20.
Avram, A., 288.
Beare, J. M., 65.
Benedek, T., 97, 187, 259, 367, 368, 369, 370.
Campins, H., 152.
Carjewschi, M., 288.
Ciferri, R., 197, 201, 206.
Cooke, W. B., 185, 186, 369.
Cremer, C., 241.
Durie, E. B., 80.
Földvári, F., 365.
Fuentes, C. A., 207.
Grin, E. I., 344.
Ilescu, M., 288.
Ito, K., 1.
Kandhari, K. C., 5.
Mackinnon, J. E., 224.
Mariat, F., 111.
Marples, M. J., 45.
Miranda, H., 56.
Ostoya, P., 183.
Ožegović, L., 344.
Pereiro Miguens, M., 23.
Rajam, R. V., 5.
Rajka, E., 256.
Raubitschek, F., 176, 285.
Redaelli, P., 201.
Rich, M. A., 189.
Schwarz, J., 254, 299.
Singer, R., 259, 261.
Smith, A. H., 261.
Stein, S. I., 261.
Stern, A. M., 189.
Thirumalachar, M. J., 5.
Tilak, S. T., 194.
Troncoso, M., 56.
Viswanathan, T. S., 150.
Walker, J., 307.
Wang, C. J. K., 299.

Copyright 1958 by Uitgeverij Dr. W. JUNK, Den Haag
Printed in Holland by
Drukkerij voorheen Gebroeders Hoitsema, Groningen

CONTENTS: CONTENUTO: INHALT: TABLE DES MATIÈRES:

Pag.

K. Ito: Classification of Dermatomycoses and Dermatomycid Based on Experimental Fungus Immunobiology. (*Gifu Med. Coll., Gifu-City, Japan*) 1

R. V. Rajam, K. C. Kandhari & M. J. Thirumalachar: Chromoblastomycosis Caused by a Rare Yeast-like Dematiateous Fungus. (*From the V. J. Hospital, Amritsar, Punjab, India*) 5

H. S. Andleigh: A Note on the Growth of Malassezia furfur. (*S.M.S. Med. Coll., Jaipur, India*) 20

M. Pereiro Miguens: La micología en España. Revisión de la bibliografía desde el ano 1946 al 1956. (*Fac de Medicina, Santiago de Compostela, España*) 23

Mary J. Marples: A Critical Survey of Medical and Veterinary Mycology in New Zealand, from 1946—1956. (*Dep. of Microbiology, Med. School, Univ. of Otago, Dunedin, New Zealand*) 45

H. Miranda & Milly Troncoso: Revision de los casos de Micosis estudiados en el Perú en el decenio 1946—1956. (*Hospital de Belén & Depto. de Biología y Parasitología, Univ. de Trujillo, Perú*) 56

J. Martin Beare: Critical Survey of Mycological Research and Literature for the Years 1946—1956 in Ireland. (*Royal Victoria Hosp., Belfast, North. Ireland*) 65

E. Beatrix Durie: A Critical Survey of Mycological Research and Literature for the Years 1946—1956 in Australia. (*Inst. of Med. Res., Royal North Shore Hosp., Sydney, Australia*) 80

Gallery of Contemporary Noted Mycologists Nrs. 13, 14, 15, 16.

T. Benedek: Selective, Chemical Epilation in the Treatment of Tinea Capitis as Contrasted with the Difuse X-Ray Epilation. (*Strich School of Med., Loyola Univ., Chicago, Ill.*) 97

F. Mariat: Physiologie des Actinomy ètes aérobies pathogènes. Recherches sur l'activité protéolytique et sur la nutrition azotée et carbonée de *Nocardia asteroides*, *N. brasiliensis*, *Streptomyces madurae*, *S. pelletieri* et *S. somaliensis*. (*Inst. Pasteur, Paris*) 111

T. S. Viswanathan: A New Species of *Erysiphe*. (*M. A.C.S. Lab. Poona, India*) 150

H. Campins: Sintesis de las investigaciones micologicas realizadas en Venezuela durante los años 1946—1956. (*Hosp. Centr., Barquisimeto, Venezuela*) 152

F. Raubitschek: A Critical Survey of Medical Mycology in Israel 1946—1956. (*Hadassah Univ. Hosp., Jerusalem, Israel*) 176

In memoriam Edouard-Jean Gilbert, par **Paul Ostoya** 183

Libri Novi 185

Gallery of Contemporary Noted Mycologists Nrs 17, 18, 19, 20.

Marvin A. Rich & Arthur M. Stern: Studies of *Cryptococcus nigricans* n. sp. I. Identification and Taxonomic Classification. (*Dept. of Bacteriol., Rutgers Univ., New Brunswick, N. J.*) 189

S. T. Tilak: A Parasitic Species of Periconia from India. (*M.A.C.S. Lab., Poona, India*) 194

R. Ciferri: Affinity between Fungi of the Verrucous Dermatitis and Sooty-Molds. (*Centro di Micol. Med. Piero Redaelli, Ist. Bot., Università di Pavia, Italia*) 197

P. Redaelli (†) **& R. Ciferri:** Saggio di inoculazioni incrociate di funghi patogeni tra animali e piante. (*Ist. Bot., Università di Pavia, Italia*) 201

R. Ciferri: Reidentification of Coccidioides periplanetae. (*Centro di Micol. Med. Piero Redaelli, Ist. Bot., Università di Pavia, Italia*) 206

César A. Fuentes: Revision de las investigaciones sobre Micologia medica y de la literatura en Cuba durante el decenio de 1945 a 1955. (*Esc. de Med., Univ. de la Habana*) 207

Juan E. Mackinnon: Revision crítica de la investigación y de la literatura micológica en el Uruguay en el período 1946—1956. (*Inst. de Higiene, Montevideo, Uruguay*) 224

C. Cremer: Critical Survey of Mycological Research and Literature for the Years 1946—1956 in Holland. (*Dept. of Dermatol. & Venereol., Univ. of Amsterdam, The Netherlands*) 241

Seminar on Histoplasmosis. Report submitted by **Jan Schwarz** 254

Libri novi 256

Gallery of Contemporary Noted Mycologists Nrs 21, 22, 23, 24.

Pag.

Rolf Singer, Sam I. Stein, Ralph W. Ames & Alexander H. Smith: Observations on Agarics Causing Cerebral Mycetisms. (*Inst. Miguel Lillo, Tucumán, Argentina; The Bertram and Roberta Stein Neuropsychiatric Research Program Inc. Chicago, Ill.; Dept. of Bot., Univ. of Michigan, Ann Arbor, Mich.; Dept. of Bot., Univ. of Michigan, Ann Arbor, Mich.*) . . . 261

F. Raubitschek: Taurocholate Agar for Chlamydospore Production by *Candida albicans*. (*Dept. of Derm. & Venereol., Hadassah Univ. Hosp., Jerusalem, Israel*) 285

A. Avram, I. Alteras, M. Carjewschi & M. Ilescu: Microsporie observée chez un groupe de lions en captivité. (Foyer épizootique déterminé par *Microsporum lanosum*). (*Centre Derm. de Bucarest, Rouménie*) 288

C. J. K. Wang & Jan Schwarz: The Etiology of Interstitial Pneumonia. Identification as *Hansenula anomala* of a yeast isolated from lungs of infants. (*Clin. Labs., Jewish Hosp. and Lab. of Mycol., Cincinnati Gen. Hosp., Cincinnati, Ohio*) 299

Jacqueline Walker: Survey of the Medical Mycological Literature of Great Britain 1946 to 1956. (*Mycol. Ref. Lab., Publ. Health Lab. Serv., London School of Hyg. and Trop. Med., London*) 307

E. I. Grin & L. Ožegović: Critical Survey of Mycological Research and Literature in Yougoslavia up to 1957. (*Centr. Dispens. for Skin and Ven. Dis., Sarajevo; Vet. Fac., Univ., Sarajevo, Yougoslavia*) 344

Obituary Stephen Ballagy (1893—1955), by **F. Földvári** 365

Libri novi 367

Announcements 372

Gallery of Contemporary Noted Mycologists Nrs. 25, 26, 27, 28.

GALLERY OF CONTEMPORARY NOTED MYCOLOGISTS

13. P. Martens, Louvain.
14. Donald S. Martin, Washington, D. C.
15. R. Bose, Calcutta
16. A. Catanei, Alger.
17. A. Chaves Batista, Recife.
18. S. N. Dasgupta, Lucknow.
19. R. Morquer, Toulouse.
20. Edward D. Delamater, Philadelphia, Pa.
21. T. Rayss, Jerusalem.
22. Albert Pilát, Praha.
23. O. N. Couch, Chapel Hill, N.C.
24. J. Ørskov, Køpenhavn.
25. Jacqueline Walker, London.
26. John A. Stevenson, Beltsville, Md.
27. M. J. Thirumalachar, Pimpri, Poona.
28. Yoshisada Takahashi, Sendai.

PLATES: TAVOLE: PLANCHES: TAFELN:

pag.

I. Edourad-Jean Gilbert 182/183
II/III. Rich & Stern 192/193
IV. Stephen Ballagi 364/365
Gallery Nrs. 13, 14, 15, 16 . . . . 96/97
Gallery Nrs. 17, 18, 19, 20 . . . . 188/189
Gallery Nrs. 21, 22, 23, 24 . . . . 260/261
Gallery Nrs. 25, 26, 27, 28 372

48 text illustrations

CLASSIFICATION OF DERMATOMYCOSES AND DERMATOMYCID BASED ON EXPERIMENTAL FUNGUS IMMUNOBIOLOGY [1]

KASUKE ITO, M. D.

(*Prof. of Dermatology, Gifu Medical College, Gifu-City, and Member of Pharmaceutical Research Institute* (*Director*: *Emeritus Professor* SHIN-ICHI MATSUMOTO), *Tekatsuki-City Osaka, Japan.*)

(3.XII.1957)

Just as a definite theory about the classification of skin tuberculosis has not yet been settled, so it is our belief that the classification of dermatomycoses including dermatomycid cannot definitively be determined unless its basic aspect is thoroughly studied. For this reason, mycologic investigations into species of dermatophytes are of great importance. Moreover, further study in the same direction is much to be desired, particularly on the basis of professional co-operation between dermatomycologists of different countries, so that exchange of fungus strains and of medical information may be continued.

Another major problem also prevents us from logically classifying dermatomycoses inclusive of "id". It is the non-specific relationship between etiology and morphology, which is still deeply rooted in dermatology. At present, it may be considered as a practically useful method to follow the classification according to sites of predilection. However, it is expected that better opinions concerning the classification of dermatomycoses will be forthcoming. On the other hand, in order to contribute towards the pathological analysis of such a big theme, it is also advisable to bridge basically the gaps between morphology and etiology. Above all, it is advisable to reconsider, from the dynamic angle, fungus immunobiologic exanthema under certain physical conditions, because of its undeniable resemblance to other entities, skin tuberculosis in particular. It is intended in this report to call attention to experimental immunobiology as a basic pathology of fungus immunobiological eruptions.

Based upon results obtained under certain experimental conditions, there is presented I) II) fungus immunobiological lesions inclusive of allergy, which are subjected to materials comparable to mycosis, tuberculosis and syphilis in man, together with III) constitutional factors, and IV) serological aspect.

---

[1] Read before the XI. International Congress of Dermatology, Stockholm, on August 1 st, 1957.

Besides, it should be mentioned that the biological activity of fungus used needs bo be standardized and kept as strong as possible. Animals used also demand constitutional standardization, because fungus immunobiologic manifestations vary according to difference in constitutional states on the part of the individual.

I. Classification of fungus immunobiologic lesions due to dorsal cutaneous reinoculation with *Trichophyton asteroides*.

1. Quick reaction with special reference to fungus corymbiform eruption.
2. Some fungus immunobiologic lesions caused on the ears of rabbits can be divided into 7 categories: fungus lymphangitis, erythema, purpura, papular necrotic trichophytid, phlebitis, arteritis and granulomas.

Generally speaking, cutaneous circulatory exsudative inflammation and fibrinoid degeneration of connective tissues were noticed in these cases. Occasionally granulomatous inflammations occurred. Besides, fungus septicemia was occasionally noticed, together with the frequent presence of fungi in the lesions. Furthermore, fungus primary hematogenous infection resulted in generalized fungus papular eruption, fungus epididymitis and fungus orchitis; fungus primary cutaneous infection (Bloch's method) resulted in occasional occurrence of deep trichophytia, comparable to kerion in man.

II. Fungus immunobiologic granuloma and its pathogenesis.

As for the pathogenesis of the lesions on the ears, some of the lesions fall into a category of allergic nature, as characterized by clinical, histopathological and immunobiologic evidence. At this point, emphasis should be placed again upon the frequent presence of fungus elements in some lesions, together with the frequent existence of fungus sepsis. For instance, in the case of the mechanism of the causation of phlebitis, embolic fungi, either in loco or transported anew, were caught in the lumina of blood vessels of the cutis. This may have caused a vascular allergic response and led to an occasional formation of perivascular granuloma.

Concerning the causation of tuberculoid granulomas another experiment was made: 1) upon an intravenous reinfection with *Trichophyton*, in rabbits with "healed" superficial scar due to previous inoculation with *Trichophyton*, the severe cutaneous circulatory exsudative disturbance resulted in granulomatous inflammation in the dermis of the said scar. 2) In the next experiment, crude fungus fraction obtained from *Trichophyton*, mechanically disintegrated, was intracutaneously injected in the said "healed" scar. The result was that the protein and polysaccharide fraction (water-soluble) elicited fungus tuberculoid tubercle, but no epithelioid cell response was caused by crude lipid. 3) A demarcating inflammatory response with abscess, centering around fibrinoid degeneration, was experimentally produced within "healed" scar upon an intracutaneous reinjection of the *Trichophyton* into the said ear. 4) It should also be noted that aminoacids contained in the serum of rabbits with fungus reinoculation lesion were paperchromatographically analysed, taking into account positive diazo-reaction in urine of reinoculation rabbits. Aminoacids obtained were: tyrosin, tyramin, histidin, histamin etc.

III. Constitutional states and fungus immunobiologic response.
It was pointed out in I that the ear of the rabbit was one of the sites of predilection of fungus immunobiologic eruptions including mycid. We performed also some experiments, which dealt with the relation between constitutional states (local and general) and fungus immunobiologic eruptions on the ears. Some abnormal constitutional conditions were artificially elicited in rabbits which had had superficial scar due to previous primary *Trichophyton* inoculation. Subsequent cutaneous *Trichophyton* reinoculation suggested a relation between constitutional environments (local and general - stress, vascular, nervous, metabolic, hormonal factors etc.) and fungus immunobiologic lesions including mycid. Concerning a relation between types of the immunobiologic lesions and variation in constitutional states, further study is needed.

IV. Serology using antigen from mechanically disintegrated *Trichophyton*.
Serological reactions in mycoses form one aspect of the basic pathology of fungus immunobiologic response on the part of the host. Emphasis should be placed on the fact that the introduction of antigen from fungus, mechanically crushed, provides a suitable antigen for serology of mycoses, experimental and clinical. The polysaccharide and protein fractions (obtained from fungus, mechanically disintegrated) exerted stronger antigenic activity, in general, than the crude lipid. In the case of tuberculosis, crude protein (obtained from tubercle bacilli mechanically crushed) has been found to be a more sensitive antigen than the other fractions.
Using antigen mechanically prepared, some experiments were performed: 1) Serological flare up of anamnestic serological reaction was caused by infection with heterologous strains of fungi. 2) Serological cross reaction among some fungi 3) Relative species-specificity of *Trichophyton asteroides* was serologically revealed in rabbits with fungus immunobiologic lesions.
It should also be mentioned that fungus immunobiologic exanthema is a partial manifestation of fungus septic infection and general immune reaction. Therefore, study on the exanthema demands not only serological study, but also pathological research into the pathological processes of the internal environment.

Summary

Better understanding of the classification of dermatomycoses requires fungus immunobiology as a basic pathology for the

classification, together with mycological investigations. Attention is drawn to experimental immunobiology as seen from comparative exanthematology of mycoses with tuberculosis. The fungus lesions were produced after dorsal cutaneous reinfection with *Trichophyton asteroides* in the rabbits. Results obtained are summarized as follows.

1. The ear of the rabbit is a site of predilection of fungus immunobiologic eruption.

2. Some fungus immunobiologic eruptions on the ears etc. are similar to dermatomycoses and skin tuberculosis in man, "id" in particular.

3. Some of the lesions on the ears show a variety of tuberculoid granulomas. Histology showed cutaneous circulatory exsudative inflammation resulting in granulomatous inflammation, and fibrinoid degeneration of connective tissues.

4. Fungus tuberculoid granulomas are analysed from the point of view of pathogenesis.

5. Fungus immunobiologic eruption is a partial manifestation of fungus septic disorder and general immune reaction, regardless of whether this results from activation of fungus in loco or from focal fungus infection.

6. Fungus immunobiologic eruptions should be further reconsidered from the viewpoint of the dynamic angle, taking into account constitutional host-parasite relationship, local and general, influencing the manifestation of the eruptions.

7. Antigen (crude polysaccharide etc.) from fungus, mechanically crushed, has proved to be suitable for serology of mycoses, experimental and clinical.

This work is but the beginning of our systematic study. Therefore, no hasty conclusion can be drawn from the results of the present experiments. Needless to say, the present work is not intended to give a direct answer to the clinical problem concerning the classification of dermatomycoses, which demand further study on basic pathology of dermatomycoses. However, it is believed that this work will help in promoting the knowledge of a basic pathology of fungus immunobiologic eruptions as seen from comparative exanthematology of mycoses with tuberculosis; and thereby will suggest a direction of research for fungus immunobiology, which is of importance for a fundamental study on the classification of dermatomycoses in man.

Reference

Bulletin of Pharmaceutical Research Institute 1955-1957 (continued).

CHROMOBLASTOMYCOSIS CAUSED BY A RARE YEAST LIKE DEMATIACEOUS FUNGUS.

By

R. V. Rajam *)

K. C. Kandhari **)

and

M. J. Thirumalachar ***)

(11.XII.1957)

With 8 figures

The authors present the following report of a fatal case of chromoblastomycosis of 7 years' duration. The patient, a boy, age 7, of rural stock, was admitted to the skin ward of V. J. Hospital, Amritsar, Punjab on 8-5-1954 under the care of one of the authors (K.C.K.) for chronic verrucous and crusted lesions on the skin of the face. From the history given by the father of the boy, it would appear that the trouble started 5 years ago when the boy was only 2 years of age, with the development of an irregular scaly red elevated patch on the left cheek which gradually spread to the chin and across to the right side of the face. On a tentative clinical diagnosis of Lupus Vulgaris with a raised erythrocyte sedimentation rate of 80 mm in 1 hour, with a slight leucocytosis, the boy was treated with streptomycin parenterally and Isoniazid orally for about 2 months. Mystrepton ointment (Glaxo) was being used as a topical application. The histological report of biopsy from the lesion said to be chronic inflammation. As the lesions showed clinical improvement, he was discharged from hospital on 2-7-54 with instruction to continue Isoniazid tablets at home.

The patient was readmitted on 5-2-1955 in a serious condition. Within a few weeks after his discharge from the hospital on 2-7-1954 it was stated that the boy developed fever and a painful swelling on the right index finger. The swelling was incised by the village barber. Within a week after the incision, multiple painful swellings began to appear on all the four extremities. These swellings increased in size, some of them softened and burst, leaving discharging sinuses. He was admitted to a nearby cottage hospital. The unruptured swellings were incised, the sinuses were drained and streptomycin and Isoniazid were administered for a period of two and a half months. Far from showing any improvement or amelioration of the condition, he showed great deterioration of his health with the occurrence of fresh swellings, joint pains, the development of widespread papular and nodular eruptions on his trunk and accompanied by intermittent fever.

---

*) Professor of V.D., and Director, Institute of Venereology, Govt. General Hospital, Madras. 3.

**) Associate Professor of Dermatology and Dermatologist, V.J. Hospital, Amritsar.

***) Chief Mycologist, Hindustan Antibiotics Research Centre, Pimpri, (Near Poona).

It was in this state he sought readmission to the skin ward of the hospital at Amritsar.

Condition on Admission

The patient was emaciated, anaemic and toxic looking with a flushed appearance. Body weight 52 lbs. Temperature on admission 101.6° F, Pulse 130 per minute and respiration 28 per minute. The patient presented the following signs and symptoms:

1. Bilateral granulomatous, crusted and verrucous plaques on the face and chin.
2. Symmetrical and multiple nodular and tense cystic swellings spherical, ovoid and fusiform in shape on the distal parts of the extremities, the hands, feet and the ankles and wrists and the outer aspect of the legs. Some of the swellings had burst leaving discharging sinuses. The edges of the sinuses were thickened and slightly verrucous, easily friable and bleeding. There were a few smaller developing nodules on the postero- medial aspect of the left thigh (Fig. 1 & 2).
3. Brown coloured, papules and tiny nodules on the trunk — firm and tender to pressure.
4. Pain and slight tumefaction of the major joints.
5. A few palpable but painless lymph nodes in the posterior triangle of the neck on the right side.
6. Spleen palpable on deep inspiration.
7. Clinical examination of the cardiovascular, pulmonary, gastro-intestinal and nervous systems revealed no abnormality relevent to his condition.
8. The family history was non-contributary.

The following investigations were performed:

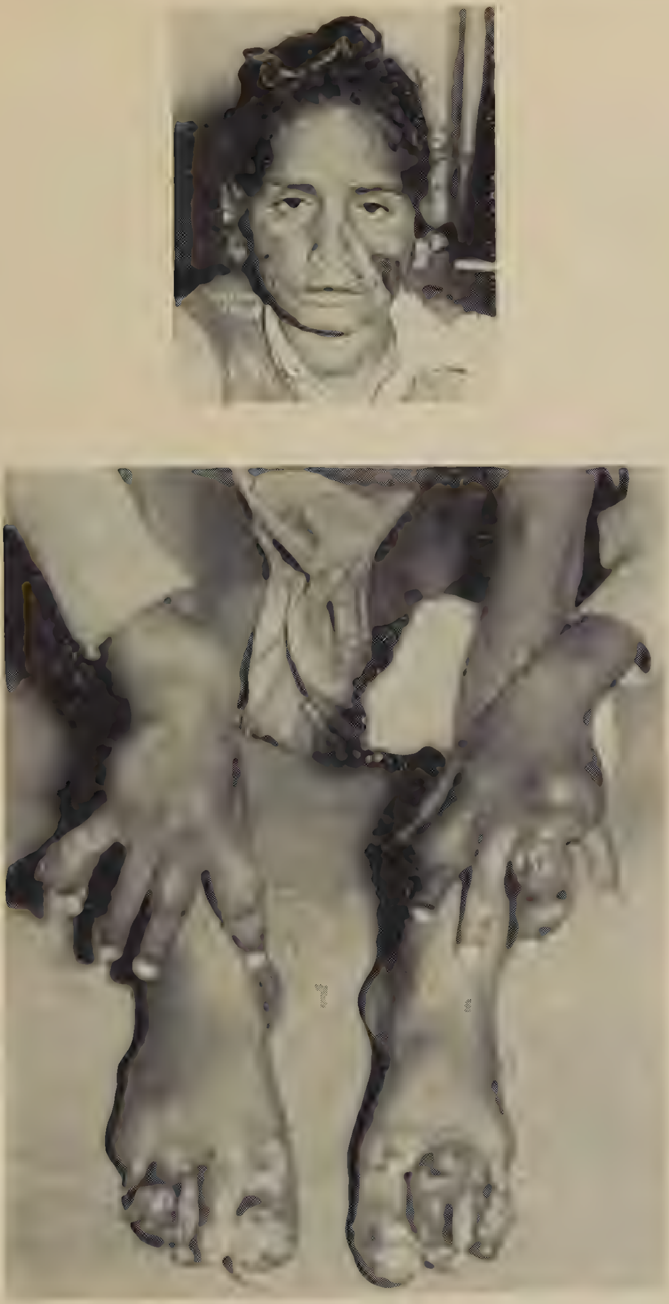
Haemogram:

R.B.C.: 3.09 millions per c.v.mm.
Haemoglobin: 9 gm%.
Total W.B.C.: 11550.
Differential W.B.C.: P—43 %; L—40 %; M—1 %; E—16 %.

Erythrocyte sedimentation rate:
124 mm per hour.

Urine Analysis:
Specific Gravity 1020; a trace of albumin, triple phosphates present.

Stools:— formed; ova of Ankylostomum duodenale present.



Figs. 1 & 2. Clinical photographs showing the symmetrical lesions of Chromoblastomycosis on the face and on the distal parts of the extremities.

Roentgenogram of the skeletal system and pulmonary fields: The following bones revealed gross destructive changes with minimal productive changes (Fig. 3).

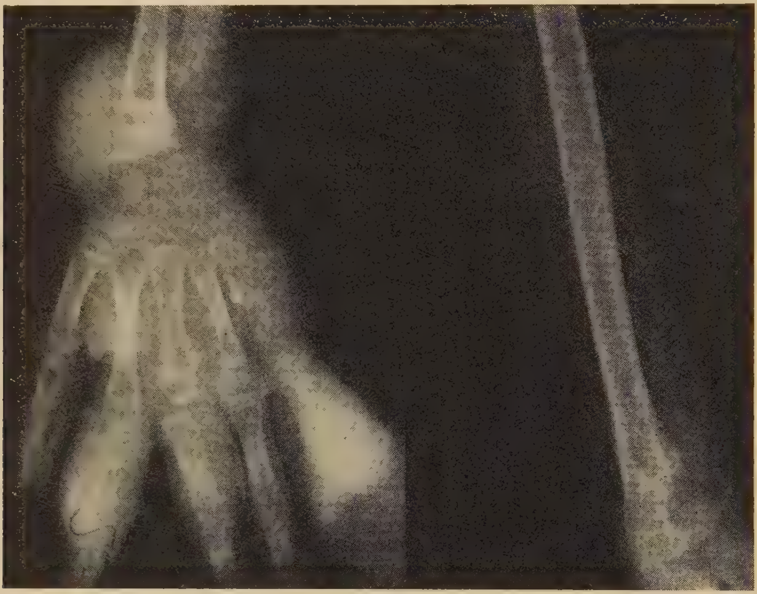


Fig. 3. Roentgenogram of the right upper extremity showing osteolytic and productive changes in the bones of the forearm, those of the hand and wrist and in the lower end of humerus.

1. Lower end of rt. humerus. 2. The bones of the forearm both sides particularly the lower one third. 3. The metacarpal and phalangeal bones of the hands (bilateral). 4. Similar bilateral involvement of the bones of the feet. 5. Extensive bilateral destructive osteomyelitis of the shaft of the fibula. 6. A localised area of erosion lower end of right tibia.

The skeletal changes corresponded to the soft tissue swellings and sinuses. The pulmonary fields revealed no abnormality. A barium series of the alimentary canal showed no abnormality. The other bones of the skeleton and skull were normal in appearance. A dirty chocolate coloured fluid was aspirated from one of the swellings. Microscopic examination of smears showed pus cells, necrotic debris, but no microorganisms. The smear was negative for acid fast bacilli. Culture of the fluid and inoculation into mice were likewise negative for pathogenic microorganisms.

Direct examination of a wet preparation revealed large numbers of yeast like organisms and septate hyphae, but was considered as contaminants. A biopsy of a fungating ulcer on the little finger was reported as chronic inflammation with epitheliod and giant cells.

Diagnosis

A diagnosis of widespread tuberculosis of the skin and bones was made.

Treatment

During the period of hospitalisation from 11-2-55 to 25-12-55, the patient received a multiplicity of antibiotic, chemotherapeutic, antifungal, topical and surgical treatments, streptomycin, penicillin, mycostatin, isonex and PAS were given in combination or in succession along with vitamins and a supporting nutritious diet.

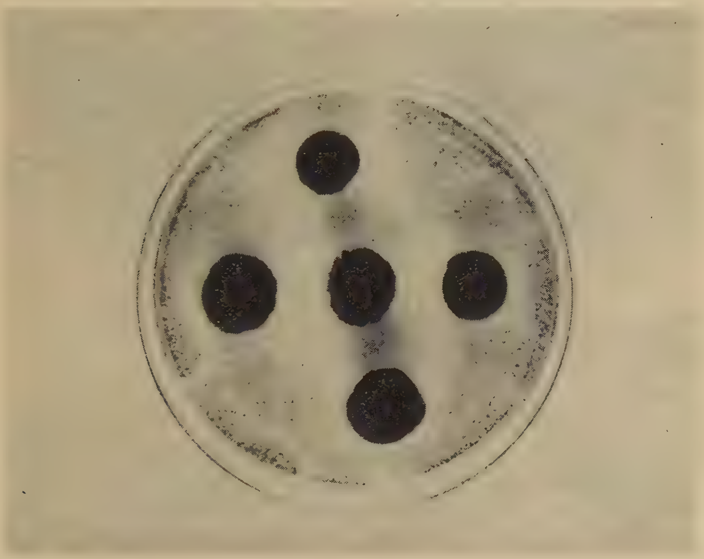


Fig. 4. Photograph of the primary culture on Sabouraud glucose agar showing circular greenish black growths on the 7th day.

The patient failed to show any response and was running an intermittent fever sometimes low, sometimes high, with short spells of apyrexia. When the temperature was running high, incision of some of the fluctuating abscesses afforded temporary relief from the pain and temperature. While under treatment, the patient suffered from two attacks of sharp epistaxis. Examination of the nostrils showed polypous masses of tissue blocking both the nostrils and on pressure exuded a dirty chocolate coloured fluid. The aspirated material from an abscess and biopsy of specimens of tissue from the lesions, were sent to the Institute of Venereology, Madras, for further investigation and pathological examination. At the Institute of Venereology, microscopic examination of a wet preparation of the pus revealed an enormous number of yeast like cells, round or oval of varying sizes, disposed singly, in short chains and in clusters along with a large number of septate filaments. The material was inoculated in Sabouraud's glucose agar and incubated at 37°C. On the 7th day circular greenish black growths about a centimetre in diameter were observed (Fig. 4) and microscopic examination of the culture material revealed a very large number of yeast like budding cells, but only a few hyphal elements. Intravenous injection of a small but unmeasured quantity of the culture into a rabbit, and the animal observed for 4 weeks, did not cause death of the rabbit. It was presumed that the fungus was non-pathogenic to laboratory animals. The biopsy specimens were processed, sectioned and stained through the courtesy of the Professor of Pathology, Madras Medical College. The sections were stained with hematoxylineosin, Giemsa, Gram, Ziel-Neelsen and periodic acid-Schiff stains.

Histopathology

Two specimens of biopsy material were examined, the first one with the intact overlying epidermis taken from the index finger of the right hand and the other from the thickened inside wall of the cystic swelling of the ankle.

Biopsy No. 1.

An exudate, consisting of blood and nuclear debris, covers the hyperkeratotic epidermis in irregular masses. The epidermis shows hyperkeratosis, parakeratosis and irregular acanthosis, the last being most marked at either end of the section. There are epithelial whorls here and there in the acanthotic epithelium. Between the horny layer and prickle cell layer, are multiple masses of debris mostly consisting of the degenerated parakeratotic epithelium (Fig. 5). Intraepidermal miliary abscesses are observed all along the section. They contain collections of polymorphonuclear leucocytes, nuclear fragments, epithelial detritus, R.B.C., and in some areas giant cells. The cutis is the seat of acute, subacute and chronic inflammatory reaction. The cellular infiltrate is polymorphous, consisting of polymorphonuclear leucocytes, lymphocytes, plasma cells, histiocytes, epithelioid cells, giant cells of both foreign body and Langhans type and a few eosinophile leucocytes. The infiltrate is diffuse and dense in the upper part of the cutis and patchy in the lower part. The subcutaneous fatty layer is also involved in the inflammatory process. In places, a tuberculoid reaction is observed, consisting of epithelioid cells and giant cells, sometimes arranged in radiating palisade fashion. In the mid and lower part of the cutis, broad strands of inflammatory fibrous tissue enclose the cellular infiltrate. Blood vessels are large, dilated, either empty or filled with blood. Here and there in the tissues, are seen large pools of lymph and extravasated blood. In one part of the section an area of subepidermal necrosis was observed palisaded by masses of hyphal elements.

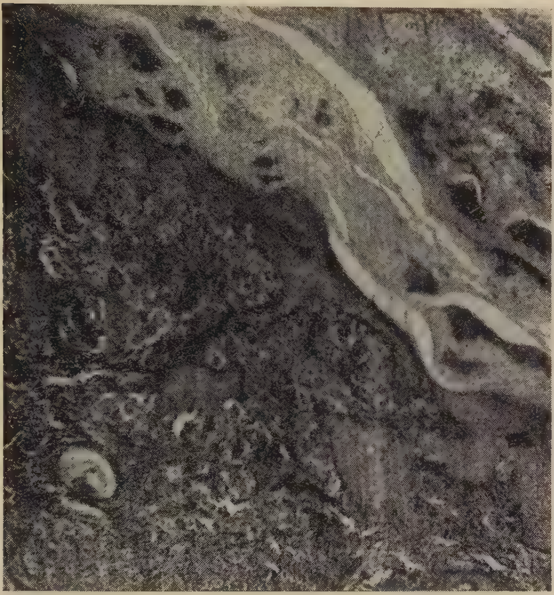


Fig. 5. Photomicrograph of a section showing hyperkeratosis, parakeratosis and irregular acanthosis with masses of debris in the hyperkeratotic and parakeratotic layers. Microabscesses, intraepidermal and subepidermal, surrounded by epithelioid cells and giant cells. Giemsa × 200.

Biopsy No. 2.

The section is a mass of granuloma consisting of multiple irregular, ramifying areas of necrosis and minute abscesses with lymphocytes here and there in patches and strands. The conspicuous feature of the granuloma is the enormous number of epithelioid cells and giant cells forming syncytial masses and radiating columns surrounding the necrotic areas with dilated blood vessels and irregular extravasations of R.B.C. throughout the section. The sections reveal enormous numbers of spores and hyphae, coloured yellow or dark brown. In sections stained with hematoxylin-eosin, the organisms are not seen so clearly, but in sections stained with Giemsa,. the colour and the morphology of the organisms are brought out with their relation to the inflammatory tissue. But to appreciate the massiveness of the infection, the section stained with periodic acid-Schiff stain should be examined. The organisms are stained bright pink and the inflammatory cells take on a light greenish blue colour.

The yeast-like cells, consisting of blastospores and chlamydospores of varying sizes and shapes, singly, in groups of two or three, in clusters and in short chains are found along side of a large number of septate branching hyphae, often in felted masses and in "crossed sticks" fashion. They are clearly demonstrated in the subcorneal zone, in the epidermal and dermal microabscesses, at the periphery of necrotic areas, inside epithelioid and giant cells. The spores assume various shapes, spherical, ovate, pyriform and club shaped, the largest diameter of the bodies varying from 2 to 12 microns. The walls of the larger spores are thick and dark. The cytoplasma takes on a brownish colour and contains an olivaceous or red pigment-like material. Budding and budded cells are a conspicuous feature but here and there bicellular forms, resulting from septation of individual blastospores or chlamydospores are seen. The hyphae are septate of varying lengths and thickness, straight, curved, tortuous, swollen irregularly into chlamydospore-like swellings. In stained sections, the types of sporulation are not clearly demonstrated. The commonest type of sporulation consists in the production of small spores laterally and terminally along the hyphae. Plenty of chlamydospores, dark and thick walled, are found singly and in clusters as well lateral and terminal to the hyphae. The majority of the hyphal filaments consist of only septate chains without any clear evidence of branching and sporulation either laterally or terminally (Figs. 6, 7). The three types of sporulation described in chromoblastomycosis in cultures of the different genera of Dematiaceous fungi, could not be clearly made out in tissue sections. But for the chromogenic character.of the fungi in cultures and tissues and the occasional septations observed in the cells, the average Clinician and Pathologist would only think of a black species of *Candida albicans* as the causative organism. The sections did not reveal the presence of any of the common pyogenic organisms or tubercle bacilli.

As the nature of the fungal organisms in smear and culture and tissue was not very evident, the primary culture and the histological sections were sent to the Chief Mycologist, Dr. M. J. THIRUMALACHAR of the Hindustan Antibiotics (Private) Ltd., Pimpri, for expert mycological study. The report of the Chief Mycologist is given below:

"Histological examination of sections showed chronic granuloma with enormous number of hyphae and dark-brown septate bodies. The hyphae are dematiaceous, closely septate, swollen at random into chalmydosporelike bodies. In wet preparations enormous number of these septate-bodies were seen, resembling those reported in other cases of chromoblastomycosis. The chief diagnostic feature of the fungus became apparent in the cultural studies. The fungus was isolated in pure culture and grown on Sabouraud's agar. At room temperature the growth is slow, moist shiny and greenish-black appearing like yeast colonies. Microscopic examination of the development of the mycelium and blastospores were made from slide cultures and spore mounts from agar cultures. In the primary growth phase where the colony is yeast-like with moist black shining colour (Fig. 8A), the growth consists of numerous blastospores which are budding rapidly. The mycelial development is very scanty. Mature blastospores measure 2.5—3 × 2 microns. The development of olive-black fluffy filamentous mycelium starts in old

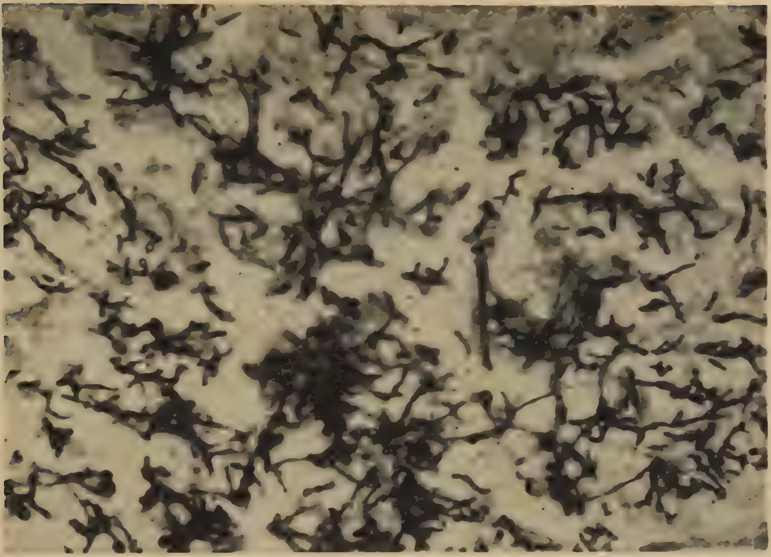


Fig. 6. Photomicrograph showing the enormous numbers of hyphal elements in felted masses and crossed stick fashion along with spores. Periodic acid-Schiff Stain × 280.

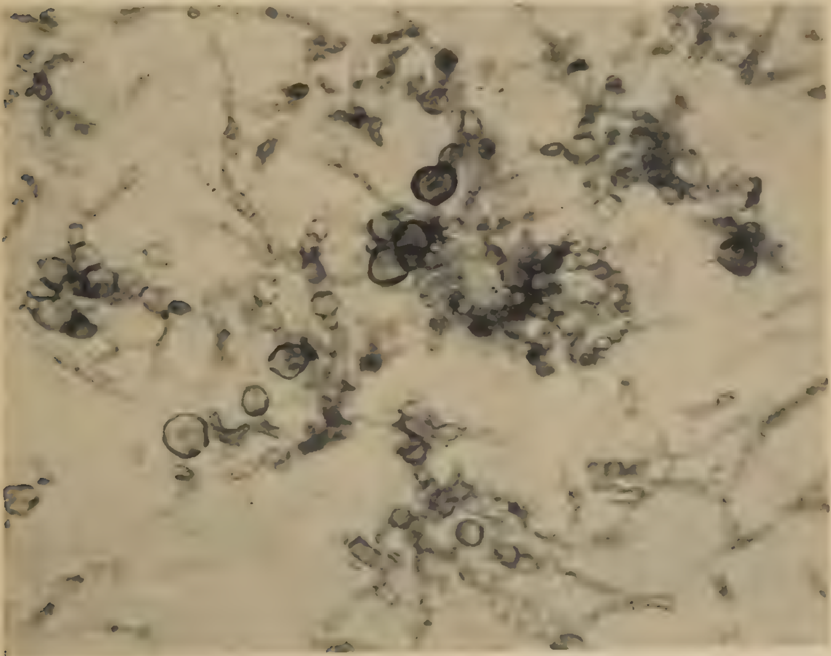


Fig. 7. Photomicrograph of the same section at a higher magnification showing hyphae with chains of spores and large thick walled chlamydospores. Periodic acid-Schiff Stain × 1200.

cultures, particularly prominent in those incubated at 28°C. (Fig. 8.B). These first appear as small sectors and may gradually occupy most of the portions of the colony. In their formation, vertically elongating hyphae are differentiated from the basal prostrate mycelium associated with the blastospores (Fig. 8.D). These aerial hyphae are septate and bear at their nodes phialide-like cells which bud off blastospores either singly or in clusters (Figs. 8. D and F). Careful microscopic examination of a mature colony with well developed aerial mycelium shows the presence of numerous *Hormodendrum* type fructificating structures. The erect conidiophores bear numerous branching chains of conidia (Fig. 8.C). The conidia get easily separated and it is often difficult to make out the branching conidial chains, characteristic of *Hormodendrum*. In such cases the fungus may be misidentified as species of *Candida* or *Torula*. In very old cultures the presence of thick-walled sclerotic cells which are brownish-black have been observed. Some of these were seen to germinate by a germ tube bearing blastospores at the apex while others were noticed to give rise to a blastospore directly by budding (Fig. 8.E).

In a recent paper on the pathogenic species causing chromoblastomycosis, SILVA (1957) has attempted to obtain the sclerotic cells in a mineral-base blood plasma medium termed as the "synthetic lymph". These scletoric cells developed *in vitro* have been considered as being comparable with the parasitic phase in the human body where histopathologic sections reveal similar multi-cellular structures. While this is an interesting finding it is not feasible to consider the sclerotic cells obtained in *in vitro* cultures as reversions to pathogenic phase in the same sense as yeast phase in cases of *Histoplasma capsulatum* and *Sporotrichum schenkii*. It is well known that in several fungi the development of sclerotic cells may be induced to develop in submerged agitated cultures by changing the growth conditions like aeration, composition of media, temperature etc. Similarly numerous fungi which produce sclerotic cells and sclerotia under natural conditions fail to produce them in liquid submerged cultures.

The occurrence of these two colony types, viz., the yeast-like blastospore phase in the early stages followed by the mycelial *Hormodendrum* type growth in the old colonies is characteristic of *Hormodendrum dermatitidis* (KANO) CONANT, which unfortunately is not so well known as other species like *H. pedrosoi* BRUMPT. According to CONANT, only a single case of isolation is known, that reported by KANO from Japan, isolated from the face of a patient who was said to have had chromoblastomycosis. KANO called the fungus *Hormiscium dermatitidis* KANO, which CARRION placed in genus *Fonsecaea*. On account of the confusion in giving proper nomenclature for the various strains and species causing chromoblastomycosis, the fungus under study is referred to *Hormodendrum dermatitidis* (KANO) CONANT, on account of the two colony types

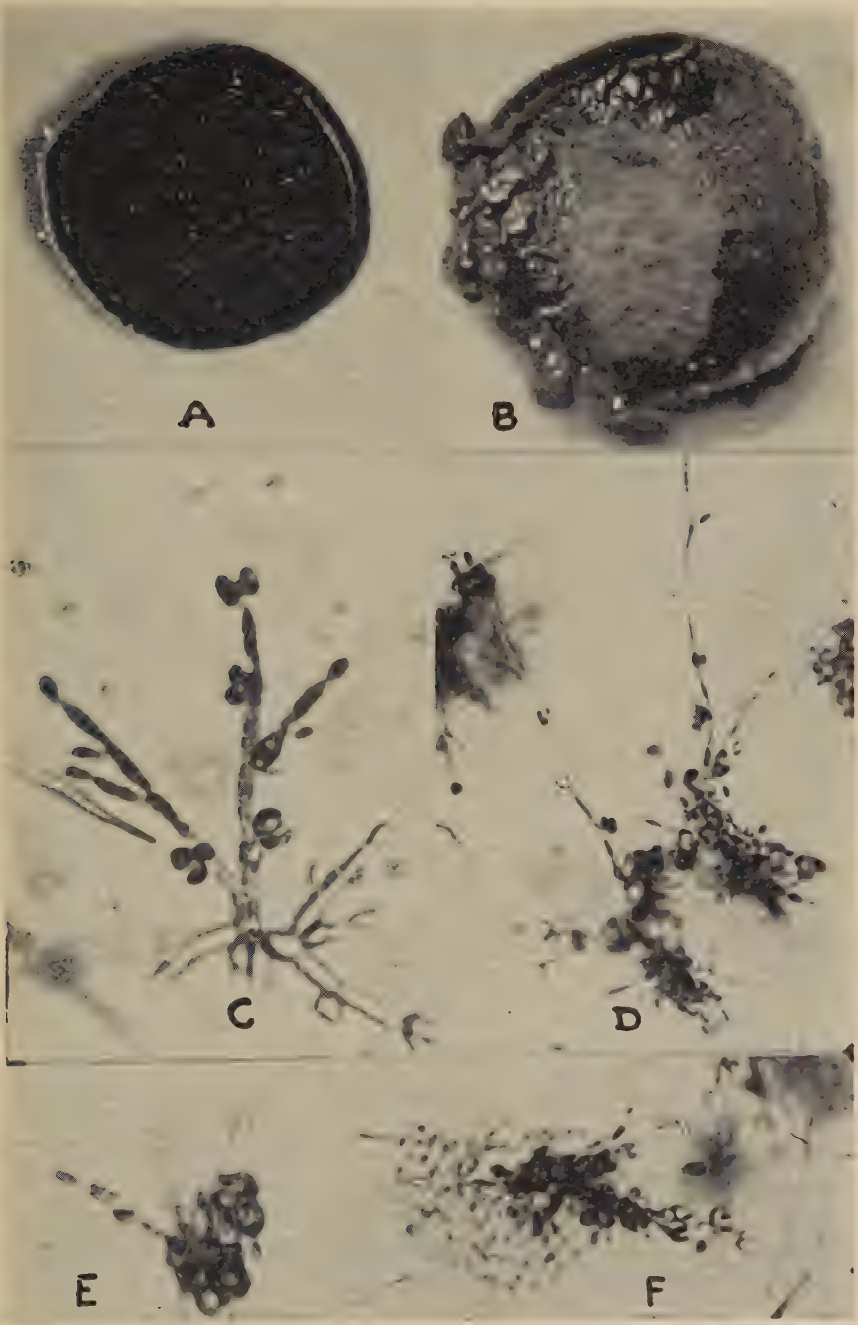


Fig. 8. A. Black yeast-like colony on Sabouraud's agar after 20 days at room temperature. × 5.
B. Showing the filamentous mycelial development in old culture 35 days old on Sabouraud's agar. × 5.
C. *Hormodendrum* type of fructification on the aerial mycelium. × 1000.
D. Development of aerial hyphae from the prostrate submerged mycelium. × 450.
E. Sclerotic cells germinating with germ tube on the left side and by direct budding on the right. × 1250.
Development of conidia in clusters at nodes of aerial hyphae. × 500.

present and similarity of morphological characters. As pointed out by CARRION also, the *Acrotheca* type of sporulation is rare and *Phialophora* type has not been observed".

Inspite of the treatment with the antibiotics the patient's condition continued to deteriorate. The lesions spread to the mouth and throat, with increasing difficulty in feeding. Fetor of the breath set in and during the last days, he was passing frequent foul smelling loose stools. The intermittent temperature continued and the patient expired on 25-12-1955. No autopsy was allowed by the relatives of the patient.

Comment

From the history, it would appear that the disease started on the skin of the face as crusted papulo-ulcerative lesions and its slow spread was confined only to the facial and chin regions for about 5 years. The original diagnosis of Lupus Vulgaris could not be sustained in the absence of bacteriological and histological evidence and the non-response to anti-tuberculous drugs. The development of an abscess on the index finger of the right hand during the sixth year of the disease, following treatment of the lesions of the face in 1954, and quickly followed by multiple painful cystic and nodular swellings on the distal portions of all the four extremities and the development of papular and nodular eruptions on the trunk, during a period of about 18 months, is suggestive of a profound systemic infection. Roentgenograms of the skeletal systems revealed that the abscesses and swellings on the extremities were only the outward visible manifestations of destructive lesions of the underlying bones. It is remarkable that inspite of such widespread invasion of the bones and soft tissues, the lungs did not show any clinical or roentgenological evidence of involvement. During the last few months of the disease, the lesions from the face spread to the nostrils, mouth and pharynx. The prolonged treatment with anti-tuberculous drugs and Penicillin, based upon a tuberculous aetiology, failed to give any relief to the relentless course of the disease. The possibility of a mycotic infection was not proved till late in the disease. When large numbers of spores and hyphae were identified in smears, in the primary culture and in the pathological tissues, at the laboratory of the Institute of Venereology, the mycotic aetiology was almost established, but the nature of the fungal organism could not be determined and in a single animal experiment, the pathogenicity of the cultured organisms was not proved. The report of the co-author of this study from Pimpri, to whom the primary culture was sent, was that the fungus grown in culture and observed over a period of 2 to 3 weeks belongs to a rare species of fungus first isolated by KANO from a case of chromoblastomycosis. Chromoblastomycosis or verrucous dermatitis caused by three recognised genera *Hormodendrum Pedrosoi*, *Hormodendrum compactum*, or *Phialophora verrucosa* is a chronic cutaneous disease characterised by the occurrence of warty, nodular, tumor or plaque-like lesions, usually affecting the lower extremity and taking years to spread along the limb. The disease has been observed most frequently in males between the ages of 30 and 50 and is slowly progressive. The lymphatics are usually not involved and metastasis by the blood stream is almost unknown. Deeper tissues are rarely involved. These fungi, like others causing deep mycoses, have a tissue phase and a culture phase. In the tissues the fungus occurs as yellow to brown rounded crescent shaped or septate bodies with thick and dark walls. The fungus cells multiply in tissues by septation and not by budding.

In the case under study, the patient was a 7 year old boy, the lesions were extensive, involving the skin of the face, the skin, the subcutaneous tissue and the underlying bones of all the four extremities, the mucous membrane of the nostrils, mouth and throat and the skin of the trunk. The lesions were polymorphous. Those on the face and chin were slightly verrucous, ulcerated, crusted and superficial. The lesions on the extremities were tense, cystic swellings unruptured and ruptured. The lesions in the nostrils and mouth were polypous and easily bleeding. Those on the trunk were papules and small nodules. In the case under study the age of the patient, the extensive, symmetrical distributions of the lesions involving skin, subcutaneous tissue, mucous membranes and bones, the pleomorphism of the lesions and the occurrence of both yeast-like cells budding and septate and the filamentous hyphae in the exudate and tissues are unlike those of chromoblastomycosis usually and commonly described in the literature. A fungus possessing a yeast phase and a mycelial phase was first isolated from a case of chromoblastomycosis by KANO in Japan (1937) who described it as a new species *Hormiscium dermatitidis*. According to CARRION, KANO was able to reproduce a typical nodule of chromoblastomycosis on the healthy skin of his patient by inoculating locally a suspension of the cultured parasite.

BERGER from Canada described a black Candida-like fungal organism causing chromoblastomycosis. CARRION of Puerto Rico who is the foremost authority on Chromoblastomycosis, by painstaking mycological studies of the so-called black yeast type of Dematiaceous fungi has clarified the confusing status of these organisms and discussed their etiological significance. This mycological group variously known as *Saccharomyces niger*, *Schizosaccharamyces niger*, *Torula niger*, *Monilia niger* and *Pullularia pullulans*, are occasionally isolated in all microbiological laboratories and generally considered as contaminants. But CARRION has shown by his studies that some of them are pathogenic to human beings. The organisms isolated by KANO from a case of chromoblastomycosis and studied by CARRION is one of them. To avoid confusion in nomenclature CARRION placed the species in genus *Fonsecaea* while others call it as *Hormodendrum dermatitidis* (KANO) CONANT. From the cultural studies of the material of the case under study by one of the authors of this report, it is evident that the isolated organism belongs to the same species which KANO recovered from a case of chromoblastomycosis and it may be claimed that the present case, is the second reported from Asia. It is stated by CARRION that in a review of the literature up to 1947, no case of chromoblastomycosis has so far been reported from Continental Asia. Recently the first case of Chromoblastomycosis affecting the vulva with metastasis of the regional lymph nodes was reported by KAKOTI & DEY from Assam who confirmed the diagnosis by direct histopathological and cultural examination. From the type of sporulation, the organism was found to belong to *Hormodendrum compactum*. It cannot be denied that medical mycology is in an undeveloped stage in India. The average clinician, dermatologist and microbiologist in our country should develop a greater awareness of deep mycoses affecting human beings and take advantage of the expert services of non-medical mycologists in the country for the proper study and understanding of fungal organisms which are pathogenic to human beings.

Summary

1. An unusual clinical type of chromoblastomycosis in a boy of 7 years with prolonged severe illness, and ultimately ending fatally is reported.

2. Mycological studies revealed that the aetiological agent is a rare type of chromogenic fungal organism, first isolated by KANO in Japan and studied by CARRION.

3. Unlike other genera of Dematiaceous fungi causing chromoblastomycosis, the fungus under study has a yeast and a mycelial phase both of which are found in the tissues of the host as well as in the culture.

4. CARRION has suggested that the fungus under discussion should be termed *Fonsecaea dermatitidis* KANO.

5. The black colonies which may occasionally be isolated in laboratories, should not be thrown away as saprophytic contaminants. These, though initially yeast like, may by further study of the growth prove to be pathogenic to human beings.

The authors gratefully acknowledge the willing and enthusiastic help rendered by the following workers in the preparation of this co-operative study:

MADRAS:

1. Dr. G. S. VISWANATHAN, Professor of Pathology, Madras Medical College, Madras.3.
2. Dr. C. W. CHACKO, Associate Professor of Serology and Serologist, Serological Laboratory, Institute of Venereology, Madras Medical College, Madras.3.
3. Dr. V. C. ANGULI, Assistant Professor of Pathology, Madras Medical College, Madras.3.
4. Dr. A. R. NATARAJAN, Chemical Examiner to the Govt. of Madras and Professor of Chemistry, Madras Medical College, Madras.3.
5. Dr. R. VEERARAGHAVAN, Research Assistant to the Chemical Examiner to the Govt. of Madras, Madras Medical College, Madras.3.
6. Sri. C. V. NATARAJAN, Stenographer, Institute of Venereology, Govt. General Hospital, Madras.3.

AMRITSAR:

1. Dr. S. S. Anand, Medical Superintendent, V. J. Hospital, Amritsar for permission to publish the hospital records.
2. Dr. S. R. Sadana and Dr. R. S. Chadha of the Department of Dermatology of V. J. Hospital for assisting in the treatment and care of the case.
3. Dr. N. L. Chitkara and Dr. M. L. Sur of the Department of Pathology of the Medical College, Amritsar for their co-operation for carrying out the histopathological and bacteriological tests in the Laboratory.

References

1. Berger, L., Beaudry, M. & Gaumond, E., Can. Med. Ass. J., 1945 as quoted in Simons' Handbook of Tropical Dermatology (1953) Vol. II p. 1297.
2. Carrion, A. L., Yeast like Dematiaceous Fungi infection the human skin (special reference to so-called Hormiscium Dermatidis). Arch. Dermat & Syph. 61: 996, 1950.
3. Conant, N. F. et al: (1947) Manual of Clinical Mycology. W. B. Saunders Company, Philadelphia & London.
4. Kakoti, L. M. & Dey, N. C., (1957) Chromoblastomycosis in India, J. Ind. Med. Ass., 28: 351.
5. Silva, M., (1957) The parasitic phase of the fungi of Chromoblastomycosis. Development of sclerotic cells in vitro and in vivo, Mycologia, 49: 318.

A NOTE ON THE GROWTH OF MALASSEZIA FURFUR

by

Dr. H. S. Andleigh, M. D. D. Bact (Lond), D.T.M.

(*Reader in Pathology, S.M.S. Medical College, Jaipur* (*India*))

(18.XI.1957)

The organism *Malassezia furfur* causes a superficial fungus disease called Tinea versicolor which is both chronic and almost asymptomatic. It is characterized by fawn coloured desquamating macules which occur mainly in that part of the body which is almost always kept covered. On account of these three reasons i.e. (i) its chronicity (2) its lack of symptoms and (3) its occurance in the hidden areas Tinea versicolor has not invoked much interest either from the pathologist or from the clinician and we know little about its cultural characters.

The organisms under the genus *Malassezia* were claimed to have been successfully cultivated by Acton & Panja in 1927. However according to Professor Conant (1955) and other authors although there are a few reports in the literature in which positive cultures have been obtained by inoculating material from the lesions into a variety of media, failure to obtain growth is such a constant finding that routine cultures are not made.

It is perhaps this constant failure to obtain growth which has probably discouraged workers to make further attempts by trying the newer media for the growth of *Malassezia furfur*. The object of this paper is, to find an easy method of culturing *Malassezia furfur*. The material was collected as follows:

Clean a fresh newly formed patch of Tinea versicolor on the patients body with 70% Alcohol. Then, with a sterilized short curved knife scrape the whithish portion of the patch and again clean the part with 70% Alcohol. The scraping was first examined microscopically by the following techniques to confirm the diagnosis of Tinea versicolor.

(1) **Alkali Treatment:**

Take very little of the collected material and put it in one drop of 10 percent KOH on a slide and cover the whole with a cover slip. After about an hour or so when the material had softened it was examined under high dry objective with condenser lowered down.

(II) **Periodic-Acid-Schiff staining:**

(a) Take some material on a glycerin-albumin coated slide and let it fix for half an hour.

(b) Fix in absolute alcohol for 2 minutes.
(c) Wash well with distilled water.
(d) Put the slide in 5 % periodic acid for 5 to 8 minutes.
(e) Again wash with distilled water.
(f) Cover with Schiff reagent for 10—15 minutes.
(g) Dehydrate with spirit and dry.
(h) Clear in xylol and mount in canada balsam.

Schiff reagent was prepared by us as follows:

Dissolve 0.5 g of basic fuchsin by pouring over it 100 ml of boiling distilled water, then, cool the solution to 50° C. Filter and add 5 ml of normal HCL and 1.0 g of anhydrous potassium metabisulphite to the filtrate. Allow the solution to stand in the dark overnight. The solution becomes colourless or of a pale straw colour. If not completely decolourized, add 0.25 to 0.5 g of animal charcoal, shake thoroughly and filter immediately.

The scrapings were used for cultures. At first the media and methods used by Dr. PANJA were tried. The composition of Dr. PANJA'S modified Petroff medium for isolation of *Malassezia furfur* is given below.

Veal infusion in 15 % glycerinated water.
Contents of an egg.
Gentiana violet 0.004 %.
Mix in equal parts, slant and solidify.

(2) The other media used by Dr. PANJA consisted of nutrient agar either plain or with either glucose or maltose. To such an agar slant a little sterilised coconut or olive oil is added to coat the surface of the slant. According to Dr. PANJA *Malassezia furfur* grows well on such a medium as opaque creamy, large colonies like those of any yeast in 1-3 days. Dr. PANJA found that oils such as olive oil, coconut oil, almond oil, castoroil, Til oil and ghee (clarified butter) all stimulated the growth but oils containing volatile fractions such as eucalyptus and mustard oil etc. completely hindered the growth. PANJA found that fatty acids such as olein and palmitin were responsible for the stimulation of the growth of *Malassezia furfur*.

The other media that were tried for the growth of *M. furfur* were the following:

1. Brain Heart Infusion agar.
2. Brain Heart Infusion agar with 30 units of penicillin and 40 units of streptomycin.
3. Brain Heart Infusion agar with penicillin 30 units and 40 units of streptomycin per ml. of the medium, with 25 % sheep blood.

In all cases three sets of media were used: one plain, the other with coconut oil and the third with oleic acid. Material from 100 cases in all has been examined. Repeated attempts were made to grow *Malassezia furfur* from the skin scrapings but even on repeated culture no growth appeared on any of these media. It was then thought worthwhile to try by adding human blood, in the proportion of 10% of blood to Brain Heart agar with penicillin and streptomycin. Several tubes were inoculated two-three times from each case but no growth appeared even on this medium. Then we added vitamin B (Biotin) in a concentration of 5 microgrammes per ml. of the plain Brain Heart infusion agar, the Brain Heart infusion agar with penicillin, streptomycin and 25% sheep blood, but no growth appeared on these media, either. Thioglycollate liquid medium was then tried in the hope that the organism was probably anaerobic or microaerophilic and would grow on this medium but there was no growth on this medium also.

Oleic acid agar medium was prepared as follows:

Take 0.5 % peptone, 0.5 % Lablemco, 0.5 % NaCl dissolved in 100 ml distilled water, with pH at 7.5, place it in the autoclave and then, add 2.5 % Difco agar. Sterilize at 5 lbs pressure for 15 minutes. Now add 1% glucose and again sterilize at 5 lbs pressure for 15 minutes. Cool it to 40° C, add penicillin and streptomycin as required, then, mix with agar before pouring into the tubes.

Now some sterilized coconut oil or oleic acid was put in with a sterilized dropper. Sterility was then tested by keeping it in the incubator for one day.

The other media containing oleic acid and coconut oil were prepared in a similar way from the different ingredients.

It will, thus, be seen that all attempts to culture *Malassezia furfur*, (which grows so extensively in the keratinised cells of the epidermis) either on the routine culture media or on any special media have failed to give a definite and satisfactory growth of this organism. The work is, however, in progress and other media incorporating epidermal tissue are being tried for the growth of *Malassezia furfur*.

My thanks are due to Dr. R. M. Kasliwal, Principal, S.M.S. Medical College, Jaipur, for allowing me to publish this paper.

Reference

1 Acton, H. W. & Panja, G. (1927) Seborrhoeic dermatitis in pityriasis capitis a Lesion caused by the Malassezia ovale; Ind. Med. Gaz. **1**: 62—603.

2 Andleigh, H. S. (1951) Mycotic Infections; Ind. J. Med. Sc. **5**: 168—171.

3 Panja, G. (1946) A new medium for enhancement of growth of the Malassezia and subsequent study of serological reactions and pathogenicity; Ind. Med. Gaz. **81**: 305—306.

LA MICOLOGÍA EN ESPAÑA. REVISIÓN DE LA BIBLIOGRAFÍA DESDE EL AÑO 1946 AL 1956

Dr. Manuel Pereiro Miguens
*(Prof. de Dermatología de la Facultad
de Medicina de Santiago de Compostela).*

(3.IX.1957)

I. DERMATOMICOSIS Y DERMATOFITOS

a). Publicaciones Referentes a la Flora Dermatofítica de España.

Hasta el momento actual las investigaciones realizadas con el fin de contribuir al conocimiento de la flora dermatofítica de nuestro país se han limitado solamente a algunas regiones del mismo.

En Madrid, Matilla & Peña Yañez (18, 26) aislan en un total de 127 cultivos positivos las siguientes especies: *T. mentagrophytes*, 2 casos; *T. Grupo crateriforme* (*T. tonsurans*), 5 casos; *T. violaceum*, 56 casos; *A. schoenleini*, un caso; *M. audouini*, 5 casos; *M. canis*, 54 casos; *E. floccosum*, 4 casos.

Gay Prieto, Peña Yañez & Jaqueti del Pozo (9), limitandose al estudio de las tiñas del cuero cabelludo, en 64 enfermos han logrado cultivar: 3 veces el *M. audouini*; 19 veces el *M. lanosum* (*M. canis*); 40 veces el *T. violaceum*, y dos veces el *T. crateriforme* (*T. tonsurans*).

Alvares Lara & Garcia (65), en 59 casos (en dos Hospitales de Madrid), aislan 40 cepas de *M. canis*; una de *M. audouini*; una de *M. gypseum*; 11 *T. violaceum*; 3 *T. mentagrophytes*; una de *T. acuminatum* (*T. tonsurans*) y dos de *A. schoenleini*.

Como puede observarse en los trabajos citados, en Madrid existe en general un marcado predominio del *T. violaceum* sobre los restantes dermatofitos, sobre todo al referirnos a las tiñas del cuero cabelludo. Le sigue en frecuencia el *M. canis*. Las tiñas favosas son excepcionales en Madrid. El unico caso citado en los trabajos de Matilla & Peña corresponde a un contagio hospitalario.

Se observa tambien en todas estas publicaciones un predominio global de las tricofícias sobre las microspórias, hecho observado con anterioridad por otros autores (Gomez Cisneros & Vallejo (43) Azua Dochao (1).).

En Barcelona, M. Casanovas (3) realiza un estudio clínico basado en las tiñas del cuero cabelludo procedentes de la Clínica Dermatológica del Prof. X. Vilanova, reuniendo desde el año 1947 al 1954 un total de 312 casos, distribuidos en la forma siguiente:

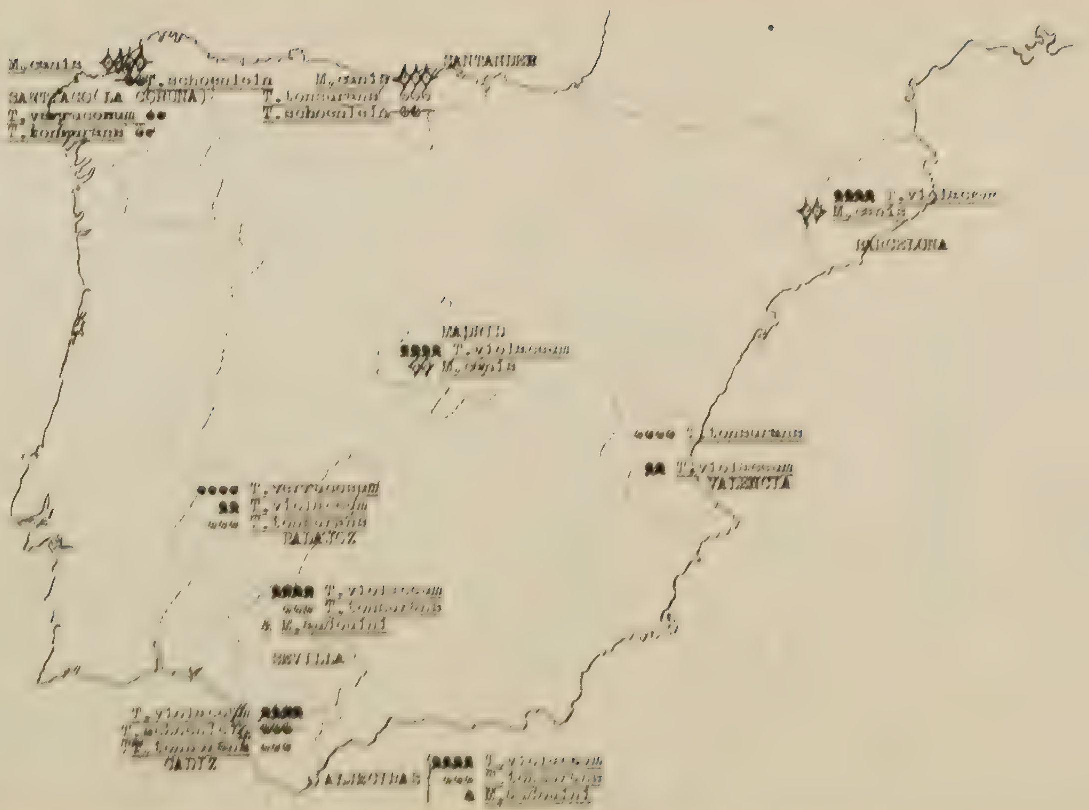

M. canis
T. schoenlein
SANTIAGO (LA CORUÑA)
T. verrucosum
T. tonsurans
M. canis
SANTANDER
T. tonsurans
T. schoenlein
T. violaceum
M. canis
BARCELONA
MADRID
T. violaceum
M. canis
T. tonsurans
T. violaceum
VALENCIA
T. verrucosum
T. violaceum
T. tonsurans
BADAJOZ
T. violaceum
T. tonsurans
M. audouini
SEVILLA
T. violaceum
T. schoenleini
T. tonsurans
CADIZ
ALGECIRAS
T. violaceum
T. tonsurans
M. audouini

Fig. 1. Distribución aproximada de los dermatofitos más frecuentes en algunas provincias de España

favus, 26 casos; tonsurante microspórica, 13 casos; tonsurante tricofitica, 241 casos; querion de Celsi, 32 casos.

Vemos por lo tanto existe en Barcelona un marcado predominio de las tiñas tricofíticas del cuero cabelludo, indicando el autor que el agente causal mas comun de las mismas es el *T. violaceum.* Los casos de favus reunidos en esta estadistica proceden en su mayor parte del sur de España y de Galicia. Las Microspórias son casi todas ellas debidas al *M. canis.* En una lesión de querion del cuero cabelludo aislan un *M. gypseum.*

X. Vilanova & M. Casanovas (48) obtienen una cepa de *Microsporum* que posee una cierta semejanza con el *M. canis.* Sin embargo, mediante un estudio detenido de la misma llegan a la conclusión de que se trata de una nueva especie dentro del género *Microsporum.*

X. Vilanova & M. Casanovas (58), observan en Barcelona y pueblos próximos una tiña del conejo domestico transmisible al hombre, dando origen en este último a lesiones de tipo ,,herpes circinado'' con gran tendencia a la inflamación, considerando a su agente causal como una variedad del *T. mentagrophytes.*

Los mismos autores (59) publican un caso de infeccion doble en una tiña del cuero cabelludo, en la cual han aislado un *T. acuminatum* y un *T. violaceum.*

En Valencia, J. Esteller (6) comprueba, como en las restantes regiones del mediterraneo y centro de España, un predominio de las tricoficias sobre las microsporias. La frecuencia de las especies aisladas por el autor es la siguiente: *T. violaceum,* 23.07 %; *T. crateriforme,* 4.80 %; *T. paracrateriforme,* 25.96 %; *T. acuminatum,* 9.28 %; *T. gypseum,* 0.96 %; *M. lanosum,* 27.88 %; *A. schoenleini,* 1.96 %; *E. inguinal,* 1.92 %; *Levaduras* 0.96 %.

Comparando esta estadistica con la realizada en el año 1940 por T. Caro Paton (43) se observa un gran aumento en la incidencia del *T. tonsurans* (*T. crateriforme* y *T. paracrateriforme*).

Iranzo Prieto, en la region de Algeciras (10, 11) ha reunido 324 tricoficias, 79 microsporias y 44 favus. Dentro de las tricoficias es *T. violaceum* el mas frecuente, seguido del *T. sabouraudi* y del *A. schoenleini.* Menos frecuente el *T. tonsurans, T. flavum, T. album* y *T. equinum.* En las microspórias prepondera el *M. audouini.*

Peña Yañez (26) en un total de 147 casos procedentes de Cadiz, aisló: el *T. mentagrophytes,* 4 veces; el *T. grupo crateriforme* 53 veces; el *T. violaceum,* 52 veces; el *A. schoenleini* 36 veces, y el *M. canis* 2 veces.

Bernardo Lopez & E. de las Mulas (12) estudian 305 casos de micosis recogidos en el Servicio de Dermatología de la Facultad de Medicina de Cadiz, de los cuales logran aislar: *T. violaceum* en 94 casos; *A. schoenleini* en 61 casos; *T. tonsurans* en 36 casos; *T. epilans* en 26 casos; *T. sabouraudi* en 19 casos; *T. mentagrophytes* en 16 casos; *T. album* en un caso; *M. lanosum* en dos casos. En los restantes hasta 305 no se logró identificar el agente causal.

Vemos por lo tanto que en Cadiz son muy frecuentes las tiñas ocasionadas por el *T. violaceum* y *T. tonsurans*, asi como los casos de favus. Es tambien interesante el escaso número de microspórias, en contraste con lo que ocurre en Sevilla, en donde, si bien predominan las tricofícias, las microspórias son mucho mas abundantes que en Cadiz.

Conejo Mir y colaboradores (4) en 508 casos procedentes de Sevilla, encuentran 45 favus, 348 tricoficias y 115 microspórias. En este total logran 93 aislamientos, distribuidos en la siguiente forma: *T. violaceum* 38.9 %; *T. tonsurans* 12.2 %; *T. epilans* 9.6 %; *T. sulfureum* 2.2 %; *T. sabouraudi* 5.3 %; *T. mentagrophytes* 6.3 %; *A. schoenleini* 7.5 %; *M. audouini* 13.9 %; *M. lanosum* 3.2 %.

En colaboracion con el Dr. Solis hemos estudiado algunas micosis procedentes de la provincia de Badajoz, habiendo aislado en 82 pacientes, 48 cultivos positivos pertenecientes a las siguientes especies: *T. tonsurans*, 28.6 %; *T. violaceum*, 18.7 %; *T. glabrum*, 4.17 %; *T. verrucosum*, 31.2 %; *T. mentagrophytes*, 2.8 %, y *A. schoenleini*, 4.17 %.

En la región de Santander, Navarro Martin (22), en un total de 383 tiñas encuentra: 110 favus, 150 tricoficias y 123 microsporias. Segun el autor los casos de favus son cada vez mas escasos. En las tricofícias han aislado las siguientes especies: *T. acuminatum*, *T. violaceum*, *T. cerebriforme*, *T. megasporados*, *T. rosaceum* y *T. faviforme*. En las microspórias obtiene con abrumadora frecuencia el *M. canis* y muy rara vez el *M. audouini*.

En Galicia nos hemos dedicado desde el año 1951 al estudio sistemático de las micosis cutaneas que procedentes de diversas zonas de las provincias Gallegas han llegado a nuestro Servicio Dermatológico de Santiago de Compostela, cuyos resultados han sido motivo de diversas publicaciones (39, 40, 41, 42, 43, 44). El ultimo estudio estadistico sobre la flora dermatofitica de nuestra region (46) corresponde a una comunicacion enviada el XI Congreso Internacional de Dermatología (Estocolmo), en el cual reunimos un total de 527 micosis, que hemos agrupado en la siguiente forma:

Tinea capitis 222 casos, con 87 % de cultivos positivos, correspondientes a las siguientes especies: *M. canis* 55.38 %; *T. schoenleini* 22.05 %; *T. tonsurans*, 13.33 %; *T. violaceum*, 6.66 %; *T. mentagrophytes*, 1.53 %; *T. verrucosum*, 0.51 %; *T. rubrum*, 0.51 %.

Tinea barbae 40 casos, 62.50 % de cultivos positivos, de los cuales un 28 % corresponden al *T. tonsurans;* 28 % al *T. mentagrophytes;* 28 % al *T. verrucosum* (estos dos últimos ocasionando casi siempre lesiones inflamatorias, procedentes de contagios del ganado vacuno); 4 % al *T. megnini* y 8 % al *M. canis* (44).

En 142 enfermos existian lesiones de la piel lampiña, de tipo ,,herpes circinado'', a veces de aspecto inflamatorio, con un 47.18 % de cultivos positivos, aislando las siguientes especies: *M. canis*, 16.66 %; *T. mentagrophytes*, 31.25 %; *T. rubrum*, 18.75 %; *T. verrucosum*, 12.50 %; *M. gypseum*, 8.33 %; *T. tonsurans*, 6.25 %;

T. violaceum, 6.25 %. En un caso hemos encontrado lesiones cutaneas de tipo fávico, en una mujer adulta ocasionadas por el *T. quinckeanum* (39).

En 22 pacientes existian lesiones inguinales de tipo eczema marginado de Hebra (tinea cruris), de los que logramos 14 cultivos positivos: *E. floccosum* en 11 casos y *T. rubrum* en 3 casos.

Solamente reunimos diez casos con lesiones dermatofiticas de de intertrigo interdigital de los pies, de los cuales aislamos 2 cepas de *T. rubrum* y dos de *T. mentagrophytes*. Otro caso mas poseia lesiones de eczema marginado de Hebra e intertrigo dermatofitico de los pies ocasionados por *E. floccosum*.

Observamos 7 onixis tricofíticas, logrando un cultivo positivo que identificamos como *T. rubrum*.

En 55 casos existian lesiones cutaneas o bien onixis originadas por levaduras del género Candida. En otros 55, lesiones de Pitiriasis versicolor; en 4, tricomicosis axilar, y en tres casos, lesiones de eritrasma. Hemos tambien observado una otomicosis originada por un *Aspergillus niger*, y un caso de piedra blanca por *Trichosporon beigelii* (40).

Vemos por lo tanto que en Galicia, dentro de las tiñas del cuero cabelludo, a diferencia de las otras regiones de España, existe un franco predominio de las microspórias sobre las tricofícias, siendo el *M. canis* la única especie aislada de las microsporias del cuero cabelludo. En el grupo de las tricoficias es el *T. tonsurans* el que prepondera. El *T. violaceum* lo hemos aislado en una proporción mucho menor que en el resto de España. Por otra parte, en nuestra región (igual que en sur de España) son muy frecuentes las tiñas favosas ocasionadas por el *A. schoenleini*.

b). Fisiologia de los Hongos.

Peña Yanez (27) realiza varios ensayos para poner en evidencia la actividad fermentativa de los dermatofitos, utilizando primeramente las técnicas de Grigoraki & David, en medios líquidos, frente al *M. canis* y *T. crateriforme* (*T. tonsurans*) observando con la primera especie un viraje ácido unas veces en los tubos con glucosa y otros con galactosa. Por el contrario, el *T. crateriforme* no fermentó ningun azucar.

El mismo autor propone la utilización de un medio sólido compuesto de agar 20 gr., peptona 20 gr., NaCl 5 gr. y agua 1000 cc., que reparte en cajas de petri agregando como indicador una mezcla de azul de bromotimol y bromocresil púrpura, añadiendo los hidratos de carbono ensayados a la proporcion de un 2 % (arabinosa, glucosa, levulosa, lactosa, galactosa, maltosa, sacarosa, rafinosa, manita y sorbita) sembrando a continuacion diversas cepas, cada una dentro de un anillo de cristal previamente colocado sobre la superficie del medio. Ensayan con esta técnica el poder fermentativo de diversos dermatofitos y hongos sapròfitos. Todos los dermatofitos fermentaron la glucosa, variando su comportamiento frente a los restantes hidratos de carbono segun las distintas especies estudiadas. Aplicando esta técnica al estudio de las especies pertenecientes al género *Microsporum* (28) obtienen los siguientes resultados: El *M. audouini* fermenta intensamente la glucosa (+ + +), con menos intensidad la rafinosa y sorbita (+ +) y no fermenta la arabinosa, galactosa y lactosa. El *M. canis* fermenta intensamente (+ + +) la arabinosa, glucosa y galactosa; menos intensamente (+ +) la rafinosa y sorbita y no fermenta la lactosa. El *M. gypseum* fermenta solamente la glucosa y galactosa (+ + +).

Nosotros (PEREIRO) (36) hemos ensayado diversos métodos auxanográficos aplicables a los hongos filamentosos (método de la germinación de los esporos (NEGRONI), método de la colonia gigante (NEGRONI) y método de los anillos (NEGRONI & DAGLIO)), con 15 cepas pertenecientes a los siguientes géneros: *Sporotrichum, Cephalosporium, Acrotheca, Phialophora, Allescheria, Pseudoallescheria*, y *Trichophyton*, encontrando de mayor utilidad para estos estudios los métodos de los anillos y el de la colonia gigante, indicando en varios cuadros los resultados obtenidos con los hongos estudiados.

Posteriormente realizamos (PEREIRO) (45), un estudio detallado del auxanograma de nitrógeno de los dermatofítos, utilizando cepas pertenecientes a todas las especies que se consideran actualmente como válidas y mediante la técnica de la colonia gigante (NEGRONI), con un medio basico similar al empleado por DIDDENS & LODDER para el estudio auxanográfico de las levaduras, agregando diversos compuestos nitrogenados (peptona, urea, asparagina, sulfato de amonio, y nitrato potasico), a las diluciones de 1/50, 1/100, 1/500 y 1/1000. En varios cuadros se indican mediante cruces los resultados obtenidos en el desarrollo de las colonias en los diversos medios, asi como los diámetros alcanzados por el micelio aéreo y profundo. En los medios con peptona a las diluciones de 1/50 y 1/100 se obtiene el máximo desarrollo macromorfológico de los cultivos. El *T. verrucosum* y algunas cepas de *T. tonsurans* necesitaron la adiccion de thiamina, piridoxina e inositol para obtener un buen desarrollo, confirmando asi las experiencias de L. K. GEORG. El *T. megnini* y el *T. violaceum* solamente crecieron en los medios que contenian peptona. El *T. rubrum, T. quinckeanum, T. gallinae* y *T. mentagrophytes* pleomorfizado muestran una estimulacion en su crecimiento en los medios que contienen urea a la dilución de 1/1000, mientras que esta substancia ocasiona una inhibicion del desarrollo a las diluciones de 1/50 y 1/100. El *T. rubrum* y *T. quinckeanum* solo se diferencian en los medios ensayados por la tendencia casi constante del primero a formar un pigmento rojo difusible cuando utilizamos una dilución de peptona de 1/1000.

X. VILANOVA & M. CASANOVAS (58) determinaron la acción de diversas vitaminas frente a los dermatofítos, comprobando que mientras que el acido para-amino-benzoico ejerce una acción inhibidora, la piridoxina, thiamina, pantotenato calcico y sobre todo el inositol, a una concentración media de 0.6 % posee una acción activadora en el crecimeinto de los dermatofítos.

Vivancos Gallego (67) estudia la fluorescencia del *T. mentagrophytes*, comprobando la perdida de esta propiedad al pleomorfizarse. No ha encontrado ninguna variación que estuviera vinculada al contenido en thiamina del medio. Mediante extracción en soluciones ácidas obtienen cristales fluorescentes azul verdosos.

c). Estudios sobre la Sistematica de los Dermatofitos.

Matilla & Peña Yañez (19, 20, 21, 24, 25) hacen una revision de conjunto sobre las diferentes especies pertenecientes a los géneros *Trichophyton*, *Microsporum* y *Epidermophyton*.

En el género *Trichophyton* consideran los cinco grupos establecidos por Conant (Manual of Clinical Mycology, ed. 1944): El grupo *crateriforme* incluye el *T. tonsurans*, *T. epilans*, *T. sabouraudi* y *T. sulfureum*. Grupo *gypseum* formado por el *T. mentagrophytes*. Grupo *faviforme* que comprende el *T. schoenleini*, *T. concentricum*, *T. violaceum* y *T. ferrugineum*. Consideran al *T. album* como una sinonimia del *T. schoenleini*. Grupo *rubrum* que incluye el *T. rubrum*. Grupo *rosaceum* formado por el *T. megnini* considerando al *T. gallinae* como una sinonimia del *T. megnini*. En el género *Microsporum* incluyen tres especies: *M. canis*, *M. audouini*, y *M. gypseum*. En el genero *Epidermophyton* una sola especie, el *E. floccosum*.

Nosotros (Pereiro) en varios trabajos (42, 43) basados sobre estudios macromorfologicos, micromorfologicos (estudios de las dimensiones de las aleurias) y fisiologicos de las cepas aisladas en nuestro laboratorio asi como algunas procedentes de colecciones extranjeras, llegamos a las siguientes conclusiones:

Todas las especies pertenecientes al grupo *Crateriforme* de Conant deben considerarse como sinonimias de una sola, que por orden de prioridad debe designarse como *T. tonsurans* (Malmsten 1845), Carrion 1946, considerando a lo sumo las especies establecidas por Conant como variedades del *T. tonsurans*. El *T. gallinae* y el *T. megnini* representan dos especies independientes, lo mismo el *T. schoenleini*, *T. verrucosum* (*T. album*) y *T. quinckeanum*, considerando en resumen las siguientes especies validas de dermatofitos: Género *Microsporum: M. canis, M. audouini, M. gypseum;* Género *Trichophyton: T. tonsurans, T. mentagrophytes, T. rubrum, T. megnini, T. quinckeanum, T. gallinae, T. violaceum, T. schoenleini, T.. verrucosum, T. ferrugineum, T. concentricum;* Género *Epidermophyton: E. floccosum.*

En uno de los trabajos (42) confeccionamos una clave sencilla que permite orientar la clasificacion de las especies citadas, basada principalmente en el especto macroscópico y microscópico de los cultivos en los medios de Sabouraud, medios de cereales y medios sintéticos.

Posteriormente, Peña Yañez & Barrios (29) llegan a conclusiones similares en lo referente a los trichophytos del grupo

Crateriforme de Conant, considerándolos como sinonimias de una única especie, el *T. tonsurans.*

d). Estudios sobre Fungicidas y Fungistaticos Frente a los Dermatophytos.

Vilanova & Casanovas (49) (55), estudian la accion fungistatica de numerosas esencias vegetales, comprobando que poseen una acción equiparable a la del acido undecilénico, en ensayos ,,in vitro'', mediante las pruebas de dilución. En las pruebas ,,in vitro'' de difusión, su acción es muy superior a la del acido undecilénico. Las de mayoı actividad estan representadas por el Neroli, Portugal, Geraniol, Citronelol, Linalol. Algunas de estas esencias vegetales poseen al mismo tiempo poder fungistático y fungicida, principalmente las derivadas del tipo fenilico y los terpenos exavalentes acíclicos, sobre todo los doblemente no saturados.

Los mismos autores (54) demuestran que es posible inducir una habituacion del *T. gypseum* frente a la presencia del ácido undecilenico. En el primer contacto el *T. gypseum* de origen no interdigital muestra una espontanea adaptación a grandes concentraciones de acido undecilénico, lo que no ocurre con el origen interdigital. Este último despues de cinco transplantes soporta cantidades de ácidos grasos similares al primero. Observan tambien que resulta mucho mas dificil el lograr una habituacion frente a las esencias vegetales.

Vilanova y colaboradores (56) (57), estudian la acción fungistatica y fungicida de los acidos grados obtenidos del cabello humano frente a los dermatofitos, observando que aquellos dermatofitos para los cuales el adulto no muestra inmunidad (*T. gypseum, A. schoenleini*, y *M. lanosum*) requieren concentraciones de estos acidos grasos diez veces mayores que las necesarias en las expeciencias con el *M. audouini.* Comprueban tambien que la acción fungistática del ácido undecilénico es muy superior ,,in vitro'' a las de los ácidos grasos totales obtenidos del cabello humano, lo mismo que la acción fungicida.

Pereiro (34) observa que la protamina posee cierto poder inhibitorio frente al *T. mentagrophytes, E. floccosum* y *Sporotrichum* sp. no observando encambio ningun efecto inhibitorio en las experiencias con *Candidas* y *M. canis.* La histona no muestra propiedades inhibitorias. Pereiro (38) aisla una cepa de *Penicillium* que inhibe el crecimiento del *T. mentagrophytes.*

J. M. Bayo & Pereiro (2) estudian la accion fungistatica y fungicida de los ésteres del acido bromoacético asociados a un detergente, frente a diversos dermatofitos, comprobando que el bromoacetato de etilo y el monobromoacetato de etilenglicol poseen un gran poder fungistático y fungicida (mas intenso en el primero) frente al *T. tonsurans, T. mentagrophytes, A. schoenleini, E. floccosum* y *M. canis*, en medios solidos y liquidos. El cloruro de alquil (cetil) dimetil-bencil-amonio tiene mayor actividad que los anteriores contra el T. *mentagrophytes*. La asociacion de los ésteres del acido bromoacético y el detergente asociados se refuerzan extraordinariamente en su acción fungistática y fungicida.

VILANOVA y colaboradores (54) ponen en evidencia que el gama hexano es eficaz contra levaduras de interes dermatológico hasta una dilucion de 1/200.000. Realizando ensayos en medios que contienen diversos azucares a demostrado que aquellos que pueden transformarse con mas facilidad en glucosa, permiten una menor actuación del gama-hexano. Los resultados obtenidos clinicamente en el tratamiento de algunos procesos cutaneos por candidas parecen ser bastante alentadores.

VILANOVA & CASANOVAS (50) estudian la accion inhibidora mutua entre diversos dermatofitos, sembrando unas especies en la proximidad de las otras en un mismo medio de cultivo.

GAY PRIETO y colaboradores (7) estudian el efecto de los rayos X sobre pelos y escamas parasitadas por dermatofitos, observando que los rayos X no ejercen accion letal alguna, alteraciones biologicas ni modificaciones de las caracteristicas macroscópicas y microscópicas de los cultivos. Los rayos X sobre el *M. canis* ocasionaron una tendencia mas rápida hacia la degeneración pleomórfica.

Nosotros (PEREIRO) (38), tratamos de investigar las relaciones existentes entre el pH y la flora de los pequeños pliegues en 50 enfermos pertenecientes al Centro de Micologia de la Facultad de Ciencias Medicas de Buenos Aires que dirige el Prof. NEGRONI. En los espacios interdigitales de los pies parasitados por dermatofitos el pH encontrado era aproximadamente 5.9, siendo generalmente mas acido cuando entre la flora asociada se encontrabas estreptococos. En los intertrigos blastomiceticos el pH obscilaba entre 6 ý 7.

BUSTINZA (67) demuestra la toxicidad del acido usnico frente a determinados microorganismos, entre ellos *C. albicans* y el *T. mentagrophytes*, y de la usnimicina (precipitado obtenico cuando se agrega a una solución acuosa de usnato sodico una sal de estreptomicina) sobre el *T. mentagrophytes* y diversas bacterias.

e). Onicomicosis.

Hemos realizado un estudio clínico y micológico de las onixis blastomiceticas clasicas y de las onixis tricofitoides descritas por NEGRONI (PEREIRO, 32). En un total de 12 casos de onixis blastomiceticas aislamos las siguientes especies de levaduras pertenecientes al género *Candida: C. albicans*, 4 veces; *C. parapsilosis*, 3 veces; *C. tropicalis*, 2 veces; *C. krusei*, una vez; *C. melinii* una vez; *C. rugosa*, una vez y *C. guilliermondi*, una vez.

En otro trabajo (PEREIRO) (47), hacemos un estudio clínico y micológico sobre las onixis tricofíticas y onixis inespecificas, revisando abundante bibliografía y basandonos en el estudio de numerosos casos de onicomicosis recogidos durante nuestra estacia en el Centro de Micologia de dirige el Prof. NEGRONI.

Vilanova (64) hace un minucioso estudio de las onicomicosis con el fin de lograr la exonicacion temporal de las uñas mediante la aplicacion de radium en su superficie. Una revision sobre la fisiología y fisiopatología de las uñas le lleva a equiparar a estas con los foliculos pilosebaceos. Discute puntos confusos de la clínica de las onicomicosis, su posible papel de reservorios de virus en determinadas dermatofitosis, aportando datos contradictorios sobre la infeccion de las uñas por hongos no patogenos.

Vilanova y colaboradores (62), llevan a cabo un estudio experimental sobre las onicomicosis, realizando 216 inoculaciones con material obtenido de lesiones humanas micósicas y cultivos de Dermatofitos, logrando obtener lesiones en 52 casos. La infección de las uñas es mas frecuente cuando la inoculacion se realiza en el lecho de la uña, siendo la lunula el area mas susceptible. En contraste con las onicomicosis espontaneas la enfermedad no persiste por encima de los 180 dias. El examen directo y los cultivos en estos casos de infección experimental son positivos mientras las lesiones se presentan en forma de manchas blancas cerca de la lúnula. Los cultivos se vuelven negativos cuando las lesiones se aproximan al borde libre de las uñas.

A. Sainz de Aja (66) se refiere a las adquisiciones recientes en el tratamiento de las onicomicosis basándose en su experiencia personal en el Hospital de San Juan de Dios (Madrid).

f). Tratamiento de las Tiñas.

Azua (1) en una revision al problema de la terapeutica de las tiñas indica como en España con los trabajos de Navarro Martin, Gay Prieto y Martinez Torres, se vienen utilizando desde hace muchos años las sales de Talio para lograr la depilación temporal de los tiñosos, utilizando la dosis de 8 mg. por Kg. de peso.

Gay Prieto & Jaqueti del Pozo (8)se ocupan en el III Congreso Hispano-Portugues de Dermatología, del tratamiento de las tiñas, llegando a las siguientes conclusiones:

a) La depilación es siempre imprescincible para el tratamiento eficaz de las tiñas no inflamatorias del cuero cabelludo.

b) Exponen las razones por las que dan preferencia a la depilación roentegen sobre el empleo de las sales de talio, limitando el empleo de estas ultimas para menores de tres años y para los que no permiten realizar el tratamiento en condiciones de seguridad (indociles, etc.).

c) De todas las tecnicas propuestas prefieren la de Schreus y Proppe (Tecnica de los 4 puntos), por considerar que con el, es menor el peligro de la superdosificacion en las areas de cruzamiento y su realización mas fácil.

d) Utilizan los siguientes factores físicos: puntos de irradiacion (parietal derecho, frontal, parietal izquierdo y occipital); distancai foco piel 25 cm; 70 Kv; 4 mA; sin filtro (valor del inherente 0,5 mm Al.).

e) Los resultados obtenidos son del 100/100 de curaciones en los enfermos hospitalizados y del 94 % en los ambulatorios.

f) Las recidivas y reinfecciones no deben someterse a nueva depilación roentgen hasta que no hayan transcurrido seis meses como minimo.

g) Los accidentes son practicamente nulos cuando se emplea una técnica adecuada.

h) Las ventajas economicas y sociales del metodo son considerables.

A. Martinez Navarro (16) es partidario de eludir la depilación en los casos en que no sea completamente necesaria. En las tiñas de breve evolucion y poca extension de las lesiones puede intentarse la curación sin depilacion total previa, con objeto de evitar los peligros siempre existentes en las depilaciones por el talio o los rayos X.

Navarro Martin (23) ha propuesto hace años la utilizacion de tripaflavina intravenosa en el tratamiento de las tricoficias profundas. Actualmente propone la utilizacion de Penicilina parenteral en estos casos, con lo que se consigue disminuir considerablemente la supuración y disminucion del dolor.

g). Alergia e Inmunidad en las Micosis Superficiales.

Bernardo Lopez & J. Rey Calero (13) en un caso de Dermatomicosis generalizada ocasionada por *T. gypseum*, logran una intradermo-reacción intensamente positiva con una fracción proteica e hidrocarbonada de Trichophytina preparada con *T. gypseum*, logrando al mismo tiempo una transmisión pasiva de la sensibilidad con estos mismos antigenos.

Los mismos autores (14) estudian las respuestas a las pruebas intradérmicas con tricofitinas totales y fraccionada procedentes de *A. schoenleini*, *T. gypseum* y *T. violaceum*, en 124 enfermos afectos de favus, epidermomicosis, tuberculosis cutaneas y eritematodes. En los enfermos favosos, las pruebas han sido positivas en un 65.3 %. Las fracciones hidrocarbonadas parecen ser las mas especificas, puesto que solamente son positivas cuando coincide el agente etiológico con el dermatofíto de la tricofitina empleada. En las tuberculosis cutaneas obtienen un 79 % de positividades con las fracciones proteicas. En los eritematodes 100 % de respuestas positivas.

En otras experiencias (15) de anafilaxis cruzada in vitro ponen en evidencia la existencia de antigenos parciales comunes en dos especies de hongos muy alejados en la clasificación micológica, uno de los cuales (*Aspergillus niger*) interfiere el crecimiento del otro (*A. schoenleini*), en los medios habituales. Consideran que el agregar antibioticos a los medios de cultivo puede enmascarar las propiedades antigenicas de los extractos fungicos. Para evitar estos inconvenientes, cuando necesitan sembrar con utilizacion de antibioticos humedecen el asa de platino en una solucion de Penicilina antes de tomar con ella las escamas o pelos.

h). Otras Publicaciones sobre Micosis Superficiales.

Vilanova & Casanovas (60), describen un caso de dermatosis dishidrosiforme de las manos y pies, de algunos meses de evolución, ocasionada por un *Aspergillus* patogeno para el cobayo, clasificado como al *A. ustus*. El examen micológico directo de las lesiones del enfermo fué negativo sin embargo en todos los cultivos desarrollo el mismo hongo en estado puro. Logran una curación rápida y definitiva con la administración de yoduro potasico por via bucal a la dosis de 4 gr. diarios.

Nosotros (Pereiro) (34), publicamos un trabajo en el que exponemos las técnicas micológicas mas elementales para la toma del material destinado a investigaciones micológicas, tanto en las micosis superficiales como en las profundas, indicando los metodos utilizados para realizar los exámenes micológicos directos asi como los cultivos.

Peña Yañez (30), indica tambien la forma de tomar las muestras destinadas a investigaciones micológicas, asi como la forma de realizar los cultivos y los medios necesarios para su aislamiento e identificación, estudiando asi mismo las pruebas inmunológicas.

Durante nuestra estancia en Buenos Aires (33), hemos descrito las técnicas utilizadas para la clasificación de levaduras aisladas de afecciones cutaneas, basandonos en las caracteristicas macromorfológicas, micromorfológicas y fisiológicas (zimograma, auxanograma, acción sobre la leche simple y tornasolada, etc.), utilizando las modificaciones de los metodos clásicos propuestas por Negroni & Daglio, incluyendo al final un cuadro en el que se resumen los resultados obtenidos del estudio de 20 cepas pertenecientes al genero *Cándida*.

Aguilera Maruri & B. Zorrilla (68) describen un caso de Pitiriasis versicolor localizada exclusivamente en una mejilla de una niña de 9 años.

X. Vilanova & C. Cardenal (69) realizan un estudio epidemiológico clínico, micológico, histopatológico y terapéutico sobre la Pitiriasis versicolor, incluido en la obra Ph. Simons "Tropical Dermatology".

II. MICOSIS VISCERALES

a). Estudios Realizados sobre las Micosis Pulmonares.

Canto Borreguero (70), realiza un estudio micológico del material obtenido por aspiración de los bronquios o por biopsia endoscópica mediante cultivos, con el fin de realizar el diagnostico de las actinomicosis respiratorias. Considera necesaria una revisión de los géneros de *Actinomycetales* considerados generalmente como saprofitos.

D. URIOSTE & MEDARDE (71) aisla dos tipos de *Nocardia* de campesinos afectados de actinomicosis pulmonar que no coinciden en sus caracteristicas micológicas con ninguna de las especies descritas dentro de este género.

ALIX Y ALIX & CANTO BORREGUERO (72) refieren un caso de Torulopsis (*Cryptoccocus neoformans*) en un paciente de 50 años, mecanico, en Madrid, con localizacion pulmonar, y otros tres casos de micosis pulmonares: una actinomicosis (*A. israeli*), una Moniliasis (*C. albicans*) y un caso que presentaba sintomas de sensibilización a *Penicillium* y *Actinomices.*

STIEFEL E., ANDREU URRA & LAZARO (73) citan tres casos de Criptococosis pulmonar en Sevilla, en pacientes de 29, 41 y 42 años.

REPETTO Y REY (74) hacen una revision de conjunto describiendo las características clínicas de diversas micosis, especialmente las pulmonares.

STIEFEL E., ANDREU URRA & LAZARO (75), realizan una revision del concepto de las Candidasis pulmonares, aportando al mismo tiempo dos casos, uno de ellos en una mujer de 56 años y otro en un varon de 25. En el examen del esputo en 65 pacientes con tuberculosis cronicas, en 12 encuentran diversas especies de *Candida,* ninguna de ellas *C. albicans.* La intradermorreaccion con un antigeno de *C. albicans* en 32 pacientes con diversas afecciones da resultado positivo en cuatro casos de tuberculosis pulmonar profunda y en uno de bronquiectasias basales.

HIDALGO DE PABLO BLANCO & MONTERO RODRIGUEZ (76) ponen en evidencia que una *Nocardia* sp. aislada de un esputo de un enfermo que padecia una actinomicosis pulmonar, ocasiona una infeccion difusa en ambos pulmones al inocularla por via intraperitoneal al conejo. Los conejos fueron sacrificados a los 20 dias, y la infeccion fue confirmada mediante exámenes anatomopotológicos.

JUNCADELLA DE FERRER (85), en la clínica B de la Facultad de Medicina de Barcelona, comunica que en un periodo de 20 años solamente ha podico encontrar con seguridad, dos casos de actinomicosis pulmonar.

b). Otras Micosis Viscerales.

VILANOVA, ESTELLER & CASANOVAS (63), observan un caso de goma micosico del cuello en un agricultor procedente de Sagunto (Valencia), en el cual mediante los cultivos logran aislar un hongo que clasifican como *Malbranchea pulchella.* Las inoculaciones realizadas al cobayo y rata blanca fueron negativas.

SANCHEZ BOTIJA (77), publica un caso en el cual descubre una ulceracion en el estomago de un buey ocasionada por un hongo perteneciente al género *Mucor.*

LEDESMA & ALGUACIL (78), han podido estudiar un caso de un paciente de 25 años, cantero, que presentaba un tumor cerebral ocasionado por el *Cryptoccocus neoformans.*

JIMENEZ DIAZ (79) publica un caso de una Moniliasis (Candidasis) urinaria por *Candida albicans* en una niña de 2 años que habia estado sometida a una terapeutica a base de Penicilina, Estreptomicina y Terramicina.

CANTO BORREGUERO (80), describe algunos hechos característicos encontrados en productos patologicos de enfermos de micosis viscerales, refiriendose especialmente al pleomorfismo. Para el diagnóstico utiliza una modificacion del metodo de Woodhouse.

CASAS CARNICERO & VELASCO ALONSO (86), publican en 1946 el primer caso de *Histoplasmosis* conocido en España hasta esa fecha. Indican que BAUNEÑOS habia asistido a tres o cuatro pacientes con una sintomatologia parecida, pero cuya etiología no pudo ser comprobada. Esto hace suponer que si se investigase con mas frecuencia en este sentido, es posible se llegasen a descubrir un mayor número de casos.

JIMENEZ DIAZ (87), entre los enfermos presentados en una de las sesiones clinicas celebradas en su servicio, existe uno de Histoplasmosis. Mediante la puncion esternal logran evidenciar unos corpúsculos que interpretan como posibles histoplasmas, lo que confirman realizando cultivos en medio de SABOURAUD.

CASAS CARNICERO (81) realiza en Valladolid pruebas intradermicas con Histoplasmina en 310 reclutas de las Fuerzas Aereas y en 93 estudiantes. En el primer grupo obtiene 4 reacciones positivas con diluciones de antigeno de 1/1000, y 25 mas positivas utilizando diluciones de 1/100. En el segundo grupo logra solamente dos casos de reacciones positivas.

ZAPATERO (88) lleva a cabo un estudio parecido entre estudiantes de la Universidad de Madrid, encontrando solamente dos resultados positivos, los cuales recaian en sujetos procedentes de Puerto Rico.

ALÉS REINLEIN & RIOS MOZO, (89) publican una extansa revision de conjunto sobre la Histoplasmosis basandose en los trabajos de autores extranjeros asi como en las escasas aportaciones Españolas.

M. SORIA (90) cita dos casos de micosis lagrimal por *Actinomicetales* observados en su clinica, y hace al mismo tiempo una revision de la bibliografia mundial.

LEY, PERAITA & LEY HIJO (91), dan a conocer un caso de actinomicosis cerebral que se manifiesta por un sindrome de la 3*a* circunvolucion frontal, evolucionando sin cuadro meníngeo, logrando una curacion total despues de la extirpación quirurgica de la lesión. Es interesante el hecho de que se ocasionase a causa de un foco orbitario del lado derecho, estando la lesion cerebral localizada en el lado opuesto.

Hace algunos años se han publicado en la revista Actas Dermosifiliograficas varios casos de Esporotricosis. Sin embargo, desde el año 1946 solamente hemos podido encontrar una comunicacion presentada a la academia de Dermatologia por los Dres. GAY & ALVAREZ CASCOS (94) que clinicamente diagnostican como esporotricosis a pesar de fracasar los cultivos.

No se han descrito en España hasta el momento actual ningun caso de Coccidioidomicosis, Blastomicosis Norte Americana (enfermedad de GILCHRIS) ni de Granuloma Paracoccidioidal.

III. Hongos del aire y su Papel Sensibilizante (Alergizante).

DIAZ RUBIO, MUÑOZ & JIMENEZ ORTA (82), estudian los hongos del aire en Cadiz desde 1948 á 1949, obteniendo 118 aislamientos pertenecientes a 26 especies, de las cuales las mas frecuentes fueron el *Penicillium umbonatum* (aislado 44 veces), *P. notatum* (41 vez), *P. digitatum* (28 veces), *P. chrysogenum* (24 veces), *P. meleagrium* (23 veces) y *P. elegans* (20 veces). Le siguen en orden de frecuencia el *Cladosporium*, *Alternaria*, *Macrosporium* y *Rhizopus*. Entre los generos restantes han sido los mas frecuentes: *Monilia*, *Oospora*, *Hyalopus*, *Volutella*, *Botrytis*, *Botryotrichum*, *Corethropsis*, *Mucor* y *Fusarium*.

La mayor incidencia de los *Penicillium* correspondio al periodo comprendido entre mayo y septiembre, mientras que el *Cladosporium* alcanzó su valor máximo en octubre y noviembre; la *Alternaria* en octubre, junio y noviembre, y el *Aspergillus* de junio a noviembre.

DIAZ RUBIO, JIMENEZ ORTA & LAMADRID (83), estudian el contenido de los hongos del aire en Cadiz y su relacion con ciertos factores metereológicos, desde el mes de abril de 1948 a mayo de 1949. El mayor contenido de esporas en el aire corresponde a los meses de Mayo y Agosto, siendo menor en los meses de invierno. En un total de 2.000 colonias obtenidas en cajas de Petri con medio de cultivo, un 67.5 % corresponden a especies de *Penicillium*, siguiendole en orden decreciente de frecuencia los siguientes géneros: *Cladosporium*, *Alternaria*, *Macrosporium*, *Rhizopus*, *Monilia* y otros 22 generos mas. No han podido establecer ninguna relacion entre el numero de colonias desarrolladas en las cajas de cultivo y la presion atmósferica, temperatura, humedad y direccion preponderante del viento.

R. ALEMANY VALL (92) estudia la sensibilidad respiratoria a los hongos del aire, para lo cual da a los enfermos cajas de petri con medio de SABOURAUD y CZAPEK para que las abran en sus dormitorios durante un tiempo determinado. Observa que los hongos pertenecientes a los géneros *Alternaria* y *Rhizopus* son los que producen reacciones mas frecuentes e importantes en los enfermos. Describe las características clínicas de los pacientes sensibles, dividiendolos en cuatro grupos: 1º Rinitis producida por los hongos con buen resultado terapéutico al tratamiento desensibilizante; 2º Asma producida por hongos, especialmente en climas maritimos, con resultados eficaces al tratamiento desensibilizante cuando los enfermos no poseen lesiones pulmonares tuberculosas; 3º Asma antigua y compleja con sensibilidad a los hongos y otros antigenos. El tratamiento desensibilizante da resultados mediocres; 4º Asma tuberculosa con sensibilidad a los hongos, sin resultados al tratamiento desensibilizante.

CANTO BORREGUERO (93) da a conocer las formas micóticas ambientales en el aire de Madrid pertenecientes al orden de los Actinomycetales. Comprueba la existencia de un habitat y localizacion sobre *Urtica Urens* como testigo edafológico. El mayor porcentage de aislamientos corresponde a los meses de mayo y junio.

GOMEZ ORBANEJA & QUIÑONES (84) estudian el papel alergizante de los hongos inhalantes en la produccion del eczema de manos, utilizando para las pruebas intradermicas realizadas en este estudio antigenos obtenidos de los siguientes generos: *Alternaria, Fusarium, Cladosporium, Mucor, Tilletia, Ustilago, Penicillium, Aspergillus* y *Helmintosporium*. En la lectura de los ,,test'' cutaneos consideran de valor a las reacciones precoces que se manifiestan a la media hora, de tipo urticariano, y a las reacciones tardias poco frecuentes, caracterizadas por la aparicion de una mancha eritematosa en el lugar de la inoculación, que termina eczematizandose.

CONEJO MIR (5), publica una nota previa sobre el papel que pueden desempeñar los alergenos inhalantes (hongos) en la etiología del estrofulo infantil. Considera que las pruebas cutaneas pueden tener valor solamente en los casos en que coinciden con ciertos hechos de indole clinica (coincidencia de los brotes en ciertas epocas del año en que la frecuencia de los hongos inhalantes es mayor, ineficacia de la terapéutica dietetica, etc.), o bien cuando puede probarse un efecto desensibilizante al utilizar una vacuna preparada de acuerdo al resultado de las pruebas cutaneas.

Por último para terminar este trabajo sobre la Micología en España, deseamos tambien señalar que en el Servicio del Prof. ORBANEJA, en el Hospital de San Juan de Dios de Madrid, se han organizado en estos últimos años (en colaboracion con el Dr. PEREIRO), unos cursos para Dermatólogos, en los cuales se les inicia en los problemas fundamentales de Micología General y Micología Médica, dando a conocer las técnicas micologias mas comunes y la forma de identificar los cultivos, contribuyendo de esta forma a incrementar el interes por la Micología Médica entre los dermatólogos Españoles.

Deseamos expresar nuestro agradecimiento a los Dres. X. VILANOVA, J. ESTELLER, L. DE AZUA, V. MATILLA, J. CONEJO MIR, y V. IRANZO PRIETO, por la amabilidad que han tenido en facilitarnos parte de la bibliografia utilizada en este trabajo, asi como al Decano de la Facultad de Medicina de Santiago Prof. ANGEL J. ECHEVERRI que nos ha permitido revisar su biblioteca particular.

Bibliografia

1). AZUA DOCHAO, L. ,,Consideraciones epidemiológicas y terapéuticas sobre las tiñas". Med. colonial **9**; 1947; 431.

2). BAYO BAYO, J. & PEREIRO MIGUENS, M. ,,La acción fungistática y fungicida de los esteres del ácido bromoacético asociados al cloruro de Alkil(cetil)-dimetil-bencil-amonio". Arch. Inst. Farmacologia Exper. **4**; fas. 1; 1952.

3). CASANOVAS, M. ,,Estudio clínico de las tiñas del cuero cabelludo" Actas Derm. Sif. **45**; 1953—54; pg. 539.

4). CONEJO MIR, J., RODRIGUEZ MORENO, T. & CONDE MUÑOZ, J. Mª. ,,Contribución al estudio de la etiologia y distribución geográfica de las tiñas en la provincia de Sevilla" Actas Derm. Sif. No. 6. Marzo 1956.

5). CONEJO MIR, J. ,,Nota previa sobre el papel que puedan desempeñar los alergenos inhalantes (Hongos) en la etiologia del estrofulo. Actas Derm. Sif. No. 6. Marzo 1956.

6). ESTELLER, J. ,,Comunicación personal".

7). GAY PRIETO, J., PEÑA YAÑEZ, J., JAQUETI DEL POZO & ALVAREZ LARA, ,,Acción de los Rayos X sobre los ,,Dermatophytes". Actas Derm. Sif. No. 5. Noviembre 1953.

8). GAY PRIETO, J. & JAQUETI DEL POZO. ,,Tratamiento de las tiñas del cuero cabelludo". Actas Derm. Sif. **45**; 1953—54; 583.

9). GAY PRIETO, J., PEÑA YAÑEZ, J. & JAQUETI DEL POZO. ,,Aportación al estudio de la flora micológica de las tiñas del cuero cabelludo en Madrid y su provincia". Med. Colonial, No. 2, Febrero, 1956.

10). IRANZO PRIETO, V. ,,Las tiñas del cuero cabelludo en la comarca de Algeciras" Actas Derm. Sif. No. 2, Febrero, 1957.

11). IRANZO PRIETO, V. ,,Comunicación personal".

12). LOPEZ, B. & MULAS, E. ,,Estudio etiológico, clínico y epidemiológico de las tiñas en la provincia de Cadiz". Actas Derm. Sif. **45**; 1953—54; 429.

13). LOPEZ, B. & REY CALERO, J. ,,Antigenos de Pransnitz-Kustuer en la tiña tonsurante" Actas **47**, 1955; 159.

14). LOPEZ, B. & REY CALERO, J. ,,Estudio de las respuestas a las tricofitinas totales y fraccionadas en las micosis cutáneas" Actas; **47**; 1955; 185.

15). LOPEZ, B. & REY CALERO, J. ,,Modificaciones en la respuesta anafilactica de las tricofitinas provocadas por el contenido del medio de cultivo. Actas **47**; 1956; 713.

16). MARTINEZ NAVARRO MARTIN, A. ,,A proposito del tratamiento de las tiñas ,,Primun non nocere" Actas **46**; 1954—55; 439.

17). MATILLA, V. & PEÑA YAÑEZ, J. ,,Estudios sobre la flora dermatofitica de España de cultivos puros." Med. Colonial No. 5, noviembre, 1951.

18). MATILLA, V. & PEÑA YAÑEZ, J. ,,Estudios sobre la flora dermatofitica de España. Especies aisladas". Med. Colonial No. 1, enero 1952.

19). Matilla, V. & Peña Yañez, J. ,,Notas Micologias". ,,Género *Trichophyton* Grupo *Crateriforme*". Med. Colonial, No. 5. noviembre 1950.

20). Matilla, V. & Peña Yañez, J. ,,Género *Trichophyton*. Grupo *Faviforme*". Med. Colonial No. 3; marzo 1951.

21). Matilla, V. & Peña Yañez, J. ,,Género *Trichophyton*. Grupo *Rosaceum*" Med. Colonial. No. 1; Julio 1951.

22). Navarro Martin, A. ,,Algunos datos sobre las tiñas de la región de Santander y Terapéutica". Actas Derm. Sif. **46**; 1954—55; 465.

23). Navarro Martin, A. ,,Sobre el tratamiento de la tricoficia profunda". Actas Derm. Sif. **46**; 1954—55; 463.

24). Peña Yañez, J. ,,Género *Microsporum*. Caracteres generales y estudio de las especies" Med. Colonial No. 4. Octubre 1952.

25). Peña Yañez, J. ,,Género *Epidermophyton*. Caracteres generales y estudio de las especies". Med. Colonial No. 4. Octubre 1952.

26). Peña Yañez, J. ,,Contribución al estudio de la epidemiologia de las tiñas en España". Med. Colonial No. 5. Noviembre 1954.

27). Peña Yañez, J. ,,Una nueva técnica para el estudio bioquimico de los hongos filamentosos". Med. Colonial No. 5. Noviembre 1955.

28). Peña Yañez, J. & Masi Pallares, R. ,,Propiedades bioquimicas de los Dermatophytes. Género *Microsporum*". Med. Colonial No. 2. Agosto 1956.

29). Peña Yañez, J. & Barrios Martin, F. ,,Estudio micologico del grupo *Crateriforme*". Med. Tropical, No. 3. Marzo 1957.

30). Peña Yañez, J. ,,Diagnostico Etiológico de las micosis". Med. Colonial No. 5. Mayo 1955.

31). Pereiro Miguens, M. ,,Métodos para la preparación del material destinado a investigaciones micológicas" Medicamenta, **15**; No. 198.

32). Pereiro Miguens, M. ,,Onixis Blastomiceticas: Su etiologia" Actas Derm. Sif. **41**; 1949; 27.

33). Pereiro Miguens, M. ,,Técnicas utilizadas en el estudio micologico de algunas cepas de *Candida* aisladas de afecciones dermatológicas" Resultados obtenidos". Actas Derm. Sif. **41**; 1949; 89.

34). Pereiro Miguens, M. ,,Acción antibiotica ,,in vitro" de la protamina e Histona frente a Dermatofitos y Candidas". Actas Derm. Sif. **42**; 1950; 12.

35). Pereiro Miguens, M. ,,El pH y la flora de los pequeños pliegues" Actas Derm. Sif. **41**; 1950; 607.

36). Pereiro Miguens, M. ,,Estudio comparativo de los métodos auxanográficos aplicables a los hongos filamentosos" Med. Colonial No. 5. Mayo 1951.

37). Pereiro Miguens, M. ,,Onixis tricofiticas e inespecíficas"

Actas Derm. Sif. **42**; 1951; 749.

38). Pereiro Miguens, M. ,,Nota previa sobre la acción antibiotica de un *Penicillium* frente a los Dermatofitos. Actas Derm. Sif. **42**; 1951; 806.

39). Pereiro Miguens, M. ,,Un caso de favus primitivo de la piel lampiña en una mujer adulta''. Actas Derm. Sif. **43**; 1951; 159.

40). Pereiro Miguens, M. ,,Piedra Blanca Europea'' (Primer caso descrito en España). Actas Derm. Sif. **43**; 1952; 537.

41). Pereiro Miguens, M. ,,Nota previa al estudio de las micosis superficiales de Galicia''. Med. Colonial No. 3, Marzo 1952.

42). Pereiro Miguens, M. ,,Contribución al estudio de la flora dermatofitica de Galicia (España). Estudio micologico de las cepas aisladas''. Atti VI Congres. Intern. di Microbiologia. Roma **5**, sez. XIV. 166. Arch. Inst. Farmacologia Exp. (Medicina). **5**; No. I y II, 1953.

43). Pereiro Miguens, M. ,,Etiologia de las tiñas''. Actas Derm. Sif. **45**; 1954; 492.

44). Pereiro Miguens, M. ,,Un caso de Microsporia de la barba''. Actas Derm. Sif. No. 1, Octubre 1955.

45). Pereiro Miguens, M. ,,Contribución al estudio de la biologia de los Dermatofitos. — El Auxanograma de Nitrógeno''. Arch. Inst. Farmacologia Exp. (Medicina) **8**; No. 1 y 2, 1955.

46). Pereiro Miguens, M. ,,Clinical and Mycologycal study of Galicia's Dermatomycosis''. XI. Intern. Congress of Derm., 1957.

47). Valdecasas, F. G., Vilanova X., Casanovas, M., & Puig Muset, P. ,,Action du gammahexane sur les levures d'interêt Dermatologique. Hypothèse au Sujet de son Activité Antimetabolique sur l'Inositol''. Arch. Inst. pharm. **80**; 1949; No. 1.

48). Vilanova, X. & Casanovas, M. ,,A study of a new species of the genus *Microsporum*''. — British J. of Derm. **64**; No. 6; 1952.

49). Vilanova, X. & Casanovas, M. ,,Untersuchungen über fungistatische und fungicide Mittel''. Arch. f. Derm. und Syph. **189**; 1949; 254.

50). Vilanova, X. & Casanovas, M. ,,Investigaciones sobre la acción inhibidora mutua que presentan ciertos cultivos de dermatophytos''. Actas Derm. Sif. No. 5. febrero 1950.

51). Vilanova, X. & Casanovas, M. ,,Investigaciones in vitro y clínicas sobre la acción del gamma-hexano frente a los hongos levaduriformes productores de procesos dermatológicos. Interpretación de su mecanismo de acción. Actas Derm. Sif. No. 6; Marzo 1949.

52). Vilanova, X. & Casanovas, M. ,,Resultados de las pruebas intradérmicas con tricofitina y levurina en diversas dermopatias''. Actas Derm. Sif. No. Junio 1950.

53). Vilanova, X. & Casanovas, M. ,,Sur l'influence de certains facteurs vitaminiques dans le développement ,,in vitro'' de quelques dermatophytes". Ann. Derm. at Syph. **79**; 1952; 25.

54). Vilanova, X. & Casanovas, M. ,,Artificially produced resistance in the *Trichophyton gypseum* in the presence of undecylenic acid and in the presence of some vegetable essences". The J. of Inv. Derm. **15**; 1950; 161.

55). Vilanova, X. & Casanovas, M. ,,The fungistatic and fungicidal activity of vegetable essential oils and their components". The J. of Inv. Derm. **20**; 1953; 447.

56). Vilanova, X., Casanovas, M., Garcia Valdecasas, F. & Puig Muset, P. ,,Investigaciones sobre los efectos fungicidas y fungistaticas de los ácidos grasos obtenidos del cabello humano del adulto". Med. Clinica. **10**; 1948; 380.

57). Vilanovas, X., Casanovas, M., Garcia Valdecasas, F. & Puig Muset, P. ,,Las propiedades fungistaticas y fungicidas de los ácidos grasos. Ácido Undecilenico. Ensayos experimentales y clínicos". Med. Clinica **11**; 1948; 224.

58). Vilanova, X. & Casanovas, M. ,,Observations cliniques et mycologiques sur une épidémie de trichophytie transmise du lapis à l'homme". La Presse Med. 59 ann. No. 82; 1951; 1760.

59.) Vilanova, X. & Casanovas, M. ,,Double Mycotic Infection in some Cases of Tinea of the Scalp". Dermatologica, vol **108**; No. 2; 1954.

60). Vilanova, X. & Casanovas, M. ,,Dermatite dyshidrosiforme des mains et des pieds, causée par un *Aspergillus*" Anna. Derm. et Syph. **78**; 1951; 292.

61). Vilanova, X. ,,Reflexiones sobre las onicomicosis al intentar su tratamiento con radium". Minerva Dermatologica, **29**; No. 5; 1954.

62). Vilanova, X., Casanovas, M. & Fransino, J. ,,Onychomycosis. An experimental study". The J. of Inf. Derm. **27**; 1956; 77.

63). Vilanova, X., Esteller, J. & Casanovas, M. ,,Gomme mycosique du cou par ,,*Malbranchea pulchella*". Ann. Derm. et Syph. **78**; 1951; 566.

64). Vivancos Gallego, G. ,,Estudio de la fluorescencia de los Dermatofitos (*T. mentagrophytes*) Actas Derm. Sif. **44**; 1952—53; 185.

65). Alvarez de Lara & Garcia, F. ,,Contribución al conocimiento micologico de las Dermatomicosis en España y de su epidemiologia". Rev. Sanid. Hig. Publ. Madr., **29**; 1955; 309.

66). Alvarez Sainz de Aja, E. ,,Del tratamiento de las onicopatias y onicomicosis en general". Actas Derm. Sif. **42**; 1950; 138.

67). Bustinza, F. ,,Contribucion al estudio de las propiedades antibacterianas y antifungicas del acido usnico y de algunos de sus derivados". Ann. Jar. Bot. **10**; 1951; 151.

68). Aguilera Maruri, C. & Brena Zorrilla, M. ,,Pitiriasis versicolor de localizacion facial exclusiva". Ann. Derm. et. Syph. **10**; 1950; 408.

69). Vilanova, X. & Cardenal, C. ,,Tinea Versicolor''. Handbook of Tropical Dermatology and Medical Mycology. R. D. G. Ph. Simons, vol. **II**. Capitulo 57, 1953.
70). Canto Borreguero, G. ,,Estudio micologico del material broncoscopico en el diagnostico de las actinomicosis respiratorias''. Rev. Clin. Esp. **46**; 1952; 359.
71). de Uriosti, R. & Medarde, I. ,,Dos casos de Nocardiosis pulmonar''. Rev. Clin. Esp. **49**; 1953; 173.
72). Alix y Alix, J. & Canto Borreguero, G. ,,Algumos aspectos de las micosis pulmonares''. Rev. Clin. Esp. **47**; 1952; 81.
73). Stiefel, E., Andreu Urra, J. & Lazaro, J. ,,La Criptococosis pulmonar''. Rev. Clin. Esp. **49**; 1953; 293.
74). Repetto y Rey, B. ,,Las micosis y en especial las pulmonares. Su investigacion por el laboratorio clinico''. Lab. Granada, **16**; 1953; 301.
75). Stiefel, E., Andreu Urra, J. & Lazaro, J. ,,A proposito de la Candidasis pulmonar, antigua Moniliasis''. Rev. Esp. Tuber. **22**; 1953; 225.
76). Hidalgo de Pablo-Blanco, M. & Montero Rodriguez, P. ,,Investigaciones sobre Actinomicosis pulmonar''. Rev. Esp. Tuber. **23**; 1954; 427.
77). Sanchez Botija, R. ,,Contribucion al conocimiento de las micosis gastricas''. An. Fac. Vet. **3**; 1951; 341.
78). de Ledesma, J. P. R. & Alguacil, D. C. G. ,,Torula histolitica cerebral''. Rev. Clin. Esp. **46**; 1952; 106.
79). Jimenez Diaz, J. ,,Moniliasis urinaria tras la terapeutica con antibioticos''. Rev. Clin. Esp. **48**; 1953; 97.
80). Canto Borreguero, G. ,,Pleomorfismo en el diagnostico de las micosis viscerales''. Rev. Clin. Esp. **52**; 1954; 387.
81). Casas Carnicero, J. ,,Estudios sobre la prueba de Histoplasmina''. Rev. Clin. Esp. **47**; 1952; 238.
82). Diaz Rubio, M., Muñoz, J. & Jimenez Orta, M. ,,Estudio de los generos y especies de hongos existentes en el aire de Cadiz, e influencias que determinan su presencia''. Rev. Clin. Esp. **38**; 1950; 280.
83). Diaz Rubio, M., Jimenez Orta, M. & Lamadrid, L. ,,Estudio durante un año del contenido en hongos del aire de Cadiz; su relacion con ciertos factores meteorologicos''. Rev. Clin. Esp. **38**; 1950; 182.
84). Gomez Orbaneja, J. & Quiñones Caravia, P. A. ,,La alergia a inhalantes (hongos) en el eczema de las manos ,,Tipos clinicos''. Actas Derm. Sif. **44**; 1952—53; 110.
85). Juncadella de Ferrer, E. ,,Micosis toracica''. Med. Clin. **11**; 1948; 358.
86). Casas Carnicero, J. & Velasco Alonso, R. Gaceta Med. Española 341; 1946.
87). Jimenez Diaz. ,,Sesiones Clinicas''. Rev. Clin. Esp. **45**; 1952; 351.

88). ZAPATERO, J. Rev. Esp. Tub. **19**; 1950; 378.
89). ALÉS REINLEIN, J. M. & RIOS MOZO, M. ,,Histoplasmosis''. Rev. Clin. Esp. **51**; 1953; 209.
90). SORIA, M. ,,Micosis lagrimal''. Med. Clin. **13**; 1949; 273.
91). LEY, E., PERAITA, P. & LEY, E. HIJO. ,,Granuloma actinomicosico cerebral''. Rev. Clin. Esp. **41**; 1951; 234.
92). ALEMANY VALL, R. ,,Sensibilidad respiratoria a los hongos''. Med. Clin. **13**; 1949; 102.
93). CANTO BORREGUERO, G. ,,La curva actinomicosica en el aire de Madrid durante 9 meses''. Rev. Clin. Esp. **52**; 1954; 811.
94). GAY PRIETO, J. & ALVAREZ CASCOS. ,,Esporotricosis de tercio inferior de pierna izquierda''. Actas Derm. Sif. **40**; 1948—49; 641.

A CRITICAL SURVEY OF MEDICAL AND VETERINARY MYCOLOGY IN NEW ZEALAND, FROM 1946-1956.

MARY J. MARPLES

(*Department of Microbiology, Medical School, University of Otago, Dunedin N.Z.*)

(21.X. 1957)

The investigation of problems of medical and veterinary mycology in New Zealand has increased in recent years, but is still carried on in isolated units with small personnel. Few hospital laboratories in the country have staff members with any special interest or training in mycology, and there are even fewer workers in the veterinary field. It is only recently that the importance of fungous infections has been realised, and much work needs to be done before even the presence of certain pathogenic species in the country has been fully recorded.

In 1948, the Medical Research Council of New Zealand set up a small research unit in Medical Mycology, consisting of a full-time research assistant, working in collaboration with a member of staff of the department of Microbiology of the University of Otago. This unit, since it functions as part of a University teaching department, has had the assistance, from time to time, of senior Science and Medical students, who have carried out limited investigations to fulfil requirements of their university studies. The results of these projects have normally remained unpublished, but are available in the collection of theses in the University Library.

In addition to undertaking diagnostic work for the area, and acting as a reference laboratory for pathogenic fungi isolated elsewhere in New Zealand, the unit has been chiefly concerned with the investigation of the incidence and distribution of the more common and superficial fungous infections. Medical publications from other parts of the country consist almost entirely of case reports, or of discussions of therapy of fungous infections as part of general dermatological procedures. In the veterinary field, a number of mycotic infections have been diagnosed, but their incidence and importance in veterinary medicine are virtually unknown.

The limited information available, therefore, permits only the most tentative generalisations, but the results obtained so far suggest that several pathogenic species occurring elsewhere, are not present in New Zealand, and that the predominant species in New Zealand are not necessarily the same as those in more densely populated countries. This has greatly affected the direction of the work of the Mycology Unit. Efforts have been concentrated on the more common pathogens, which have been studied from an ecological aspect, and interest has been directed toward problems of epidemiology and the interrelation of the parasite with its host and with its fellow parasites, rather than to those of improved therapy or the demonstration of the presence of unusual species. The following paragraphs deal first with studies on the Dermatophytes and later with investigations which have been made on the other pathogenic fungi.

Tinea capitis

This condition has received considerable attention. In all parts of New Zealand, dermatologists and laboratory workers agree that *Microsporum canis* is the predominant cause of tinea capitis and corporis, conditions which are relatively common among children in all parts of the country. It is only rarely that other species are isolated from scalp or body infections. MARPLES (1951) found that 87% of 186 cultures of pathogenic fungi, isolated from scalp lesions could be indentified as M. *canis* and similar results have been obtained elsewhere. The absence of widespread epidemics of ringworm confirms the almost complete absence of *Microsporum audouini* which is only very infrequently isolated. KAY (1954) described three cases of scalp ringworm, due to this species, which occurred in Auckland, the largest town in the Dominion and its most important port. This paper describes the clinical and mycological findings, and the treatment of the cases, and attention is drawn to the probability that the increasingly cosmopolitan nature of the population may result in an increasing incidence of *M. audouini* and other pathogens in the community.

Another dermatophyte which may be important in the aetiology of tinea capitis, especially in the North Island is *Trichophyton sulphureum* (now regarded by some authorities as a variant of *T. tonsurans*). FOX & RUSH-MUNRO (1953) recorded the clinical and mycological findings in 9 cases of tinea capitis caused by this species. They give a detailed account of the diagnostic procedures necessary for the identification of the aetiological species, and also stress the possibility of the introduction of species, alien to New Zealand, not only from Europe but from the Pacific Islands where tinea corporis is a common complaint.

Ecology of *Microsporum canis*.

The Medical Research Council unit has made a special study of *Microsporum canis* which has been described in a series of papers. In an investigation into the clinical course of scalp ringworm, due to *M. canis*, three clinical patterns were established (MARPLES 1951). These were described under the names "no spread", "local spread" and "generalised spread" in which large areas of the scalp showed scattered single fluorescent hairs under the Woodlight. Evidence was brought to show that the majority of infections were the result of contact with cats. A seasonal incidence of infections, over 4 years, was demonstrated, and was confirmed in subsequent years, the highest incidence of new infections occurring during March, April and May (Autumn in the Southern Hemisphere.)

In a later paper (MARPLES & CHAPMAN 1954) the history of an outbreak of ringworm, due to *M. canis*, in a residential institution was described. Eight of the ten child residents were involved. The examination of 92 school contacts failed to reveal any evidence of transmission, and a plea for the alteration of the regulations regarding school attendance was made.

In a further study on the ecology of *Microsporum canis* (MARPLES 1956) the clinical findings and environmental conditions of 171 infected children from 138 families were investigated. The clinical pattern of the infections could not be associated with the sex, age, source of infection or social status of the child. Evidence for a cat source of infection was found in 30.5% of the families, and for a dog source in 3.6% and the following types of transmission were demonstrated: cat to child; dog to child; child to child; child to adult; child to cat; dog to cat; cat to dog. The social status of the families, as determined by the work of the bread-winner, and the condition of the homes which were visited paralleled those of the general population of the district, and it was suggested that, in New Zealand, ringworm was not associated with poverty or neglect and that no social stigma should be attached to the development of an infection. An earlier publication by FRASER & HACKETT (1954) was based on some of the findings in the first 78 cases.

The therapy of scalp and body ringworm has not been extensively studied. DIMENNA (1949) described the effectiveness of ink as a therapeutic agent for ringworm, as compared with other fungicidal substances. Ink is a commonly used home treatment for ringworm, but the experiments showed that its fungistatic properties were far less than those of standard remedies. GOTTS (1951) described the technique of iodine ionisation, a treatment used in a series of cases in Otago. PARK (1950, 1953) has included the treatment of ringworm, in papers dealing with topics of general dermatology.

Infection of cats with *Microsporum canis* has attracted the interest of veterinary workers, and diagnosis and treatment of infected kittens and puppies is carried on in many centres. HILL (1956) published an account of the clinical findings, and the diagnostic procedures necessary for the demonstration of infection in domestic pets. He believes that kittens are the commonest source of human infections in New Zealand, and draws attention to the insignificant nature of the lesions in the animals and to the value of the Wood lamp as an aid to diagnosis.

During the course of routine diagnostic work, the Otago unit has, from time to time, isolated strains of a fungus, which appears to be a new species of *Microsporum*. This has been described under the name *Microsporum distortum* (DI MENNA & MARPLES 1954). The species appears to be restricted to the province of Otago, and has not, so far, been reported from other areas of New Zealand.

Superficial infections in Polynesians.

The incidence of superficial fungous infections among Polynesians living in New Zealand, and in certain Pacific Islands has been recorded as part of general or special clinical surveys (MARPLES 1950, FAINE & HERCUS 1951, MARPLES & BACON 1953, MC CARTHY & MARPLES 1954). Tinea capitis appears to be a rare condition among Polynesians, while tinea corporis is common. In one Samoan survey (MARPLES 1950), tinea versicolor was found to be present in 49% of village adults, while 6% of children under 12 years had tinea corporis of a less superficial type. Similair findings were reported in other surveys. Very few isolates of the pathogens responsible for these infections have been made, owing to the difficulties imposed by the field conditions but identification of the strains which have been obtained suggests that Trichophytons predominate and that both *T. rubrum* and *T. sulphureum* are widespread. *Trichophyton concentricum* appears to be less important as a parasite of Polynesians than it is of Fijians.

A number of superficial mycotic infections of laboratory and domestic animals has been diagnosed in New Zealand, and the following dermatophytes have been isolated- *Microsporum canis* from cats and dogs, *Trichophyton mentagrophytes* from cattle, horses and guinea pigs, *T. verrucosum* from cattle and *T. gallinae* from poultry (HARTLEY, unpublished).

Tinea pedis.

Tinea pedis is another human condition which has received some attention. In 1948, the incidence of tinea pedis in 381 male and 187 female students of the University of Otago was investigated (MARPLES & DI MENNA 1949). The presence of a pathogenic fungus was demonstrated in 17.8% of the male and 5.9% of the female students — a significant difference between the sexes. Among males the incidence was significantly more in those with military service (26.5%) than in those without (12.2%). Of the sixty strains of pathogenic fungus isolated, 49 were identified as *T. mentagrophytes*, 2 as *T. rubrum*, one as *T. violaceum* and 8 as *Epidermophyton floccosum*.

In a later study carried out in 1955 (MARPLES & BAILEY, in press) the clinical condition and microbiological findings in the interdigital spaces of 175 students were studied. These subjects were divided into three clinical groups:

those in which the interdigital skin appeared to be normal,
those who had asymptomatic maceration or scaling of the space, and
those in whom an abnormal interspace was associated with itching,

burning or pain at the time of examination. The fourth interdigital spaces were sampled for the presence of both fungal and bacterial pathogens, the first interspace being sampled as a control. The table shows the bacterial or mycological findings of the three clinical groups.

TABLE 1.

Laboratory findings in 175 subjects examined for the presence of Tinea pedis.

Micro-organisms isolated	All inter-spaces normal	Abnormal inter-space no symptoms	Abnormal inter-space-subjective symptoms	Total
Number of subjects.	45	96	34	175
Pathogenic Fungus demonstrated 4th space.	8.9%	12.5%	58.8%	20.6%
Staphylococcus epidermidis 4th space	60.0	36.4	41.2	43.4
Staphylococcus epidermidis 1st space	91.1	77.0	76.5	80.6
Non-haemolytic staphylococcus 4th space	91.1	81.3	82.4	84.0
1st space	97.8	92.7	94.1	94.3
Haemolytic staphylococcus .				
4th space	88.9	88.5	94.1	89.8
1st space	68.9	85.5	88.2	81.7
Coagulase positive staphylococcus 4th space	8.9	9.4	64.7	20.0
1st space	2.2	4.2	23.6	7.4
both spaces . . .	2.2	4.2	23.6	7.4
+ pathogenic . . . fungus 4th space .	2.2	3.1	47.0	11.4
Non-haemolytic diphtheroid				
4th space	48.4	79.1	73.5	70.3
1st space	20.0	41.6	23.6	32.6
Haemolytic diphtheroid . . .				
4th space	13.3	19.7	2.9	14.8
1st space	8.9	6.2	0	5.7
Other bacteria 4th space . .	2.2	7.3	11.8	6.8
1st space	4.4	16.6	8.8	10.3

It was noteworthy that the presence of subjective symptoms was significantly associated with the presence of a pathogenic staphylococcus alone, or together with a pathogenic fungus, and it was suggested that the discomfort of tinea pedis was due to the invasion of the interspace by pathogenic staphylococci rather than to its colonisation by a pathogenic fungus. *Trichophyton* species predominated among the fungal strains isolated.

Candida albicans

The presence of this organism and of other yeast-like fungi occurring as human or animal parasites has received some attention. *Candida albicans* has been diagnosed as the cause of disease in birds and an account of the diagnostic features of infection in poultry has been published by SALISBURY (1949).

In 1951, the Medical Research Council Unit carried out an investigation of the incidence of *C. albicans* in the mouths, fingers and faeces of 278 children and in the mouths and fingers of 137 adults (MARPLES & DIMENNA 1952). Mouth washings were found to yield a greater number of positive strains than swabbing of the gums. *Candida albicans* was isolated from the mouths of 33.5% of the children and from 50.5% of the adults. Faecal strains were obtained from 30.8% of the samples. No strains of *C. albicans* were isolated from the fingers of children or adults.

The incidence of non-pathogenic yeasts isolated during the same survey was reported by DIMENNA (1954a) she found that *Saccharomyces* spp., *Torulopsis glabrata* and *Candida parapsilosis* were the principle non-pathogenic yeasts found in the oral cavity, but that only a few individuals carried them. *C. albicans* accounted for 83% of all yeasts isolated from the mouth. The faecal flora was more varied, but again *C. albicans* pre-dominated, forming 67% of all isolates. The non-lipophilic yeasts isolated from the skin resembled those obtained by sampling the air and immediate surroundings both in quality and quantity. *Debaryomyces*, *Cryptococcus*, *Rhodotorula* and the yeast-like phase of *Cladosporium* were the genera most frequently isolated. *Pityrosporum* spp. were observed by direct examination in over 95% of 87 samples of dandruff.

Candida albicans and other "yeasts" have been searched for in other environments. PARLE (in press) reported the results of sampling the intestines and or faeces of 200 mammalian species. He isolated *C. albicans* from many of his samples. He also successfully maintained strains of *Saccharomycopsis guttalata* isolated from the intestine of rabbits on media containing liver extracts (PARLE 1956). This species had not been isolated in artificial culture before. A series of 80 soil samples have also been examined for the presence of pathogenic yeasts, and from two of these, pathogenic strains of *Candida albicans* were isolated (DIMENNA & PARLE 1954).

Two new species of yeasts were recovered by DIMENNA from samples taken from substrates in the human environment. These have been described under the names *Cryptococcus terreus* and *Debaryomyces marama* respectively (DIMENNA 1954b & c).

Candida albicans has been isolated from a number of pathological conditions in New Zealand. Oral and vaginal thrush are relatively common, and occasional generalised infections, some of which have been fatal, have developed. No records of these cases have been presented for publication.

Systemic Mycotic Infections.

The invasion of the deeper tissues by pathogenic fungi has been reported only rarely in New Zealand, and several species, important elsewhere, have not yet been recorded in this country. In 1948 Professor J. K. KESSEL visited New Zealand and read a paper before the Section of Public Health and Nutrition of the Seventh Pacific Science Congress. This paper (KESSEL et al 1949) was subsequently published in New Zealand, but it dealt with mycoses encountered in an area of the United States of America, and not with those occurring in New Zealand.

Actinomycosis.

This disease is not strictly a mycotic infection, but has been included in the present survey, in accordance with the customary grouping of Microbiological topics. Human cases occur sporadically in New Zealand and present clinical features, similar to those found elsewhere. SMITH (1953) reported two unusual cases, in one of which the pathogen invaded the right testis and in the other the quadriceps muscle.

The infection is more commonly encountered in animals and has been diagnosed in cattle, pigs and horses. WEBSTER (1949) published an account of the clinical features, diagnosis and treatment of actinomycosis in cattle, and BRUERE (1955) drew attention to the importance of *Actinomyces bovis* as a cause of chronic digestive disturbance. He described an outbreak of actinomycosis which involved 16 animals in a beef herd of 400 Hereford Cross Black Poll steers 3 to 4 years of age. In 9 animals "woody tongue" developed and in 2, the maxilla was involved. In five animals which were wasted, and had suffered from recurrent diarrhoea, and other cronic symptoms, the organism was shown at post-mortem to have invaded areas in the wall of the rumen. These areas were thickened and contained pockets of pus in which typical "sulphur granules" could be demonstrated.

Chromoblastomycosis.

There is only one published record of this condition in New Zealand. The case was reported by HILL, COOK & SAXBY (1953). The patient, an elderly male Chinese market gardener, had a chronic granulomatous lesion on his forearm, from which a strain of *Hormodendrum pedrosi* was isolated.

Cryptococcosis.

Infection of the central nervous system by *Cryptococcus neoformans* occurs more commonly in New Zealand than in some other geographical areas. During the years 1947—1955, five fatal cases of cryptococcal meningitis have occurred. A report of the clinical, mycological and pathological findings in these cases has been prepared for publication (Willis et al. 1957). The geographical distribution of the cases is of particular interest. All five have occurred in the same agricultural area which has a population of less than 100,000 and three infections developed in middle-aged women living in the same small town. No cases have been recorded elsewhere in New Zealand, although they have been earnestly sought for, since 1947 when the first diagnosis was made. The occurrence of five infections in individuals living in a restricted geographical area appears to be more than coincidential, but so far, no common source of infection has been found. Numerous soil samples from the area have been examined but *C. neoformans* has never been isolated. diMenna (1955a) failed to isolate this fungus from 100 soil samples, nor was she successful in finding it in 22 milk samples although strains of other species of *Cryptococcus* capable of growing at 37°C were isolated (diMenna 1956).

Air-borne Fungal Spores.

Surveys of the incidence of fungal spores in the atmosphere have been carried out in New Zealand, and, since the work was carried out, in part, to assist in dealing with problems of fungal allergy, the reports of this work have been included in the present survey.

Ambler & Vernon carried out a survey of the atmospheric spore load in the city and suburban areas of Auckland (Ambler & Vernon 1951 and Dye & Vernon 1952) published the results of a two-year survey of mould spores carried out in stations situated in different parts of New Zealand. Two petri dishes containing malt agar were exposed for 5 minutes to the air at 23 stations. The plates were incubated and the colonies identified as far as genera. The six most common genera isolated were *Cladosporium*, *Epicoccum*, *Pleospora*, *Stemphylium*, *Penicillum* and *Alternaria*. The number of spores present in the atmosphere was greatest in the summer months, and at this time "showers" of the spores of certain species were frequently observed. Of the common genera recovered, only *Penicillium* failed to show a seasonal variation.

diMenna (1955) reported the results of a programme of quantitative air sampling. She used a Manning slit sampler at fortnightly intervals, both in-doors and out-of-doors in Dunedin. The predominant genera isolated were *Penicillium*, *Cladosporium* and *Rhizoctonia* and the highest count of both moulds and yeasts was obtained during the month of June.

This survey demonstrates only too clearly the many problems of medical and veterinary mycology, which remain to be investigated in New Zealand. There is, however, a growing interest in the fungal pathogens and an increased opportunity for the technical training necessary for their study, so that perhaps the next report of this kind will show that New Zealand has made a more considerable contribution to the study of Medical mycology.

Bibliography of New Zealand Publications of Medical and Veterinary Mycology.

Ambler, M. P., & Vernon T. R. (1951) "A survey of the atmospheric spore load in the Auckland City and Suburban area". N. Z. J. Sci. Tech A. **33,** 78.

Bruere, A. N. (1955) "Actinomycosis of the digestive tract in Cattle." N. Z. Vet. J. **3,** 121.

di Menna, Margaret, E. (1950) "Ink in the treatment of Tinea capitis and corporis. Studies in vivo and vitro." N. Z. Med. J. **48,** 484.

di Menna, Margaret, E. (1952) "The routine identification of *Candida albicans*" J. N. Z. Ass. Bact. **7,** 1.

di Menna, Margaret, E. (1954a) "Non-pathogenic yeasts of the human skin and alimentary tract, a comparative survey" J. Path. Bact. **48,** 89.

di Menna, Margaret, E. (1954b) "*Debaryomyces marama* n. sp. isolated from the air." J. Gen. Microbiol. **10,** 65.

di Menna, Margaret, E. (1954c) "*Cryptococcus terreus*" n. sp. from soil in New Zealand. Ibid. **11,** 195.

di Menna, Margaret, E. (1955a) "A search for pathogenic species of yeasts in New Zealand soils." Ibid. **12,** 54.

di Menna, Margaret, E. (1955b) "A quantitative survey of Aerial Moulds and Yeasts in Dunedin, New Zealand" Trans Brit. Myc. Soc. **38,** 119.

di Menna, Margaret, E. (1956) "A search for *Cryptococcus neoformans* in milk" Ant. Von Leeuw. **22,** 331.

di Menna, Margaret, E. & Marples, Mary J. (1954) "*Microsporum distortum*" sp. nov. from New Zealand. Trans Brit. Myc. Soc. **37,** 373.

di Menna, Margaret, E. & Parle, J. N. (1954) "Some extra-human occurrences of a pathogenic yeast." Proc Univ: Otago. Med. Sch. **32,** 2.

Dye, M. H., & Vernon, T. R. (1952) "Air-borne Mould spores a New Zealand Survey" N. Z. J. Sci. Tech. B **34,** 118.

Faine, S., & Hercus, C. E. (1951) "Infections in Rarotonga, Cook Islands." Trans: Roy: Soc: Trop: Med & Hyg. **45,** 341.

Fox, P. B., & Rush-Munro, F. M. (1953) "Tinea capitis due to *Trichophyton sulphureum*." N. Z. Med. J. **52,** 488.

Fraser, W. N. C. & Hackett A. H. (1954) "A Study on Tinea capitis" Ibid. **53,** 162.

Gotts, M. E. (1951) Appendix II in "Some observations on the Occurrence and clinical course of Tinea capitis or corporis in Otago." Ibid **50,** 460.

Hill, B. H. R. (1956) "Ringworm diseases affecting the Cat." N. Z. Vet. J. **4,** 157.

Hill, B. H. R., Cook, L. G. & Saxby, C. (1953) "Chromoblastomycosis (Dermatitis verrucosa). Report of a Case" Aust. J. Dermat. **2,** 80.

Kay, R. G. (1954) Tinea capitis due to *Microsporum audouini.* N. Z. Med. J. **53,** 252.

Kessel. J. F., Yeaman, Antoinette & Holtzwart, Frances (1949). "Mycoses encountered in the Pacific Southwest area of the United States of North America." Ibid. **48,** 346.

McCarthy, D. D. & Marples Mary J. (1954) "A study of the Incidence and Aetiology of Skin infections in a group of Maori children." Ibid. **53,** 232.

Marples, Mary. J. (1947) "The diagnosis of Fungous infection" Ibid. **46,** 422.

Marples, Mary. J. (1950) "The Incidence of certain skin diseases in Western Samoa: a preliminary survey." Trans: Roy: Soc: Trop: Med. & Hyg. **44,** 319.

Marples, Mary. J. (1951) "Some observations on the occurrence and clinical course of Tinea capitis & corporis in Otago. N. Z. Med. J. **50,** 460.

Marples, Mary. J. (1953) Ch 55. "*Microsporum* infection of the smooth skin" and Ch 66 "Tinea capitis et Barbae". Handbook of Tropical Dermatology Vol. II. Elsevier Pub. Co.

Marples, Mary. J. (1956) "The Ecology of *Microsporum canis* Bodin in New Zealand." J. Hyg. **54,** 378.

Marples, Mary. J. & Bacon D. F. (1953) "Observation on Yaws and certain skin diseases in Manono, Western Samoa. Trans: Roy: Soc: Trop: Med. & Hyg. **47,** 141.

Marples, Mary. J. & Bailey, Margaret, J. (1957) "A search for the presence of pathogenic bacteria and fungi in the interdigital spaces of the foot." Brit. J. Derm. (in press).

Marples, Mary. J. & Chapman Eileen. N. (1954) "Tinea capitis caused by Microsporum canis." Report of an outbreak in a Dunedin Institution." N. Z. Med. J. **53,** 158.

Marples, Mary. J. & di Menna, Margaret, E. (1949) "A survey of the incidence of interdigital fungous infection in a group of students of the University of Otago." Med. J. Aust. **1949,** 156.

Marples, Mary. J. (1952) "The incidence of *Candida albicans* in Dunedin, New Zealand." J. Path. Bact. **64,** 497.

Park, R. G. (1950) "Some advances in the treatment of Skin Diseases." N. Z. Med. J. **49,** 127.

Park, R. G. (1953) "Common skin diseases in the Schoolchild" Ibid. **52,** 265.

PARLE, J. N. (1956) "The growth of *Saccharomycopsis guttulata*" Ant. Von Leeuw **22,** 237.

PARLE, J. N. (1957) J. Gen. Microbiol: in press.

SMITH, FLORA (1953) "Actinomycosis. A report of two unusual cases." N. Z. Med. J. **52,** 171.

WEBSTER W. M. (1949) "Actinomycosis (Woody Tongue) in Cattle" Sheep farm. ann. (Massey Agric. coll.) **87**.

WILLIS, J. D., MARPLES, MARY J., DI MENNA, MARGARET. E., RODDA, R., PULLAR T. H. (1957). "Cryptococcal (Torula) meningitis in New Zealand"' N.Z. Med. J. **56,** 99.

REVISION DE LOS CASOS DE MICOSIS ESTUDIADOS EN EL PERU EN EL DECENIO 1946—1956.

HERNAN MIRANDA ¹) & MILLY TRONCOSO ¹)

(2.IX.1957)

(Con 1 fig.)

En 1937, PEDRO WEISS & TEODORO ZAVALETA (39) publicaron el primer caso de micosis profunda observado en el Perú, con la comprobación necesaria. WEISS trajo al Perú el conocimiento adquirido en Alemania y fue el primero que trató la especialidad con amplio conocimiento. Sin embargo, desde esta publicatión hasta la tesis de O'HARA (29) presentada en 1945, hay un vacío en la literatura, lo que significa que se diagnosticaron casos que no llegaron a ser publicados, o que en su defecto, se trataron enfermos de micosis con diagnósticos equivocados. Mas, ninguna revisión estaría completa sin mencionar a EDMUNDO ESCOMEL, notable médico peruano, cuyos trabajos en Micología, a pesar de carecer del rigor científico necesario, tienen el mérito de formar parte de la obra general del autor, que apreciada en conjunto es de mucho valor por representar una inquietud por los problemas de la patología peruana que él comenzó a desentrañar.

En 1946, TORRES PINZÁS (36) presentó el trabajo ,,Actinomicosis pulmonar en el Perú''. Contiene la descripcion de dos casos.

En 1947, A. J. MAYorga opta el grado de Bachiller con la Tesis ,,Tratamiento de la Tinea pedis con el ácido undecilénico'' (19).

WEISS & P. AGUILAR (42) el mismo año publican el trabajo ,,Casos de Micosis profunda encontrados en el Perú''. Comprende este trabajo, un caso de Criptococcosis pulmonar, uno de Esporotricosis linfática i otro de Esporotricosis diseminada. El primero fue un hallazgo de autopsia y no está consignada la procedencia. De los casos de Esporotricosis, uno procede del Alto Monzón y el otro de Cajamarca.

En 1948, POLINÉSTOR AGUILAR presenta la Tesis de Bachillerato ,,Estudio botánico y clínico de las Tiñas en el Perú'' (1). Es una revisión de 9.300 niños entre los que encuentra 152 positivos comprendidos entre los 7 y 12 años de edad. En 120 se cultivó *Trichophyton* (*tonsurans, mentagrophytes* y *violaceum)* y en 20, *M. canis*. Este trabajo fue mas tarde, publicado en revista (2).

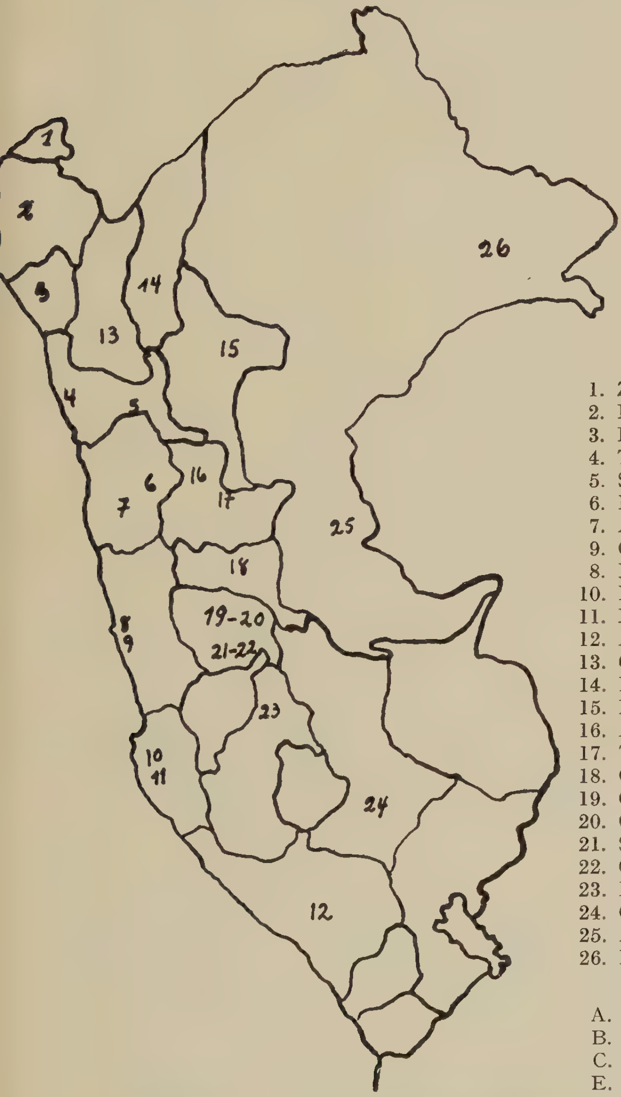
ALFONSO NICHO, poco después se gradúa de Bachiller en Medicina con la Tesis ,,Contribucion el estudio de las micosis profundas en el

---

¹) Medico del Hospital de Belén. Catedrático de Biología y Parasitologia-Universidad de Trujillo.

Fig. 1. MAPA DE PROCEDENCIAS

Cuando se citan dos nombres, el segundo corresponde al Departamento.



1. Zarumilla-Tumbes (R)
2. Piura (R)
3. Lambayeque (R)
4. Trujillo-Libertad (A) (C) (R)
5. Stgo. Chuco Libertad E)
6. Huari-Ancash (E)
7. Ancash (R)
9. Callao (B?) (R)
8. Lima (R)
10. Ica (M) (A)
11. Nazca-Ica (T)
12. Arequipa (R)
13. Cajamarca (E) (R)
14. Bagua-Amazonas (B) (R)
15. Lamas-San Martín (B) (R)
16. Alto Monzón-Huánuco (E)
17. Tingo María-Huánuco (H) (B) (R)
18. Oxapampa-Pasco (B)
19. Cercapuquio-Junín (B)
20. Chanchamayo-Junín (B)
21. San Ramón-Junín (B)
22. Concepción-Junin (Tn)
23. Huanta-Ayacucho (B)
24. Cusco (R)
25. Alto Ucayali-Loreto (B)
26. Iquitos-Loreto (B) (R)

A. Actinomicosis
B. Blastomicosis
C. Cromoblastomicosis
E. Esporotricosis
H. Histoplasmosis
M. Maduromicosis
R. Reactoresalla Histplsm.
T. Torulosis (*C. neoform.*)
Tn. Tinea nigra (*Cl. wern.*)

Perú", (25). Esta, obra, ejemplar en varios aspectos abarca una investigación bibliográfica desde el siglo pasado, correspondiente al Perú y trata el aspecto etiológico clínico y terapéutico con seriedad y minuciosidad raras de ver. Comprende el trabajo, dos casos de Actinomicosis, uno cérvico facial i otro abdominal, en los que señala éxito terapéutico con penicilina i sulfadiazina. El primer caso, procedía de Trujillo, lugar en el que vivió siempre. El segundo fue un caso de Icâque acudió al Hospital Dos de Mayo. El paciente de Esporotricosis diseminada procedía de Ancash (Huari) i el otro, de Cajamarca i es el mismo publicado por WEISS & Aguilar (42) quienes vieron al enfermo de manera independiente llegando al mismo diagnóstico. El quinto caso presentó una Maduromicosis del brazo i de la pelvis, cuyo agente etiológico se identificó como perteneciente al Gen. *Streptomyces*, hongo obtenido en reiteradas oportunidades de lesiones profundas no contaminadas. Procedencia: Ica (Molinos). Los casos presentados en esta tesis fueron publicados mas tarde en trabajos aislados (26) (27) (44).

Tambien en 1948 los doctores P. WEISS & L. A. FLORES publicaron el trabajo ,,Nuevos casos de Linfogranulomatosis micosica encontrados en Lima" (40) de estos, tres son realmente nuevos y el cuarto es el mismo publicado por WEISS & ZAVALETA años atras (39). Los puntos de procedencia de estos pacientes son: Cercapuqio (Junín); Alto Ucayali, Amazonas y el cuarto es un italiano radicado en el Callao, molinero y acostumbrado a llevarse pajas a la boca, con frecuencia. En cuanto a esta procedencia debe aclararse que el enfermo estuvo alguna vez en la Montaña (zona selvática del Perú). WEISS en su trabajo ,,Geografía de las enfermedades en el Perú" (41) dice: . . . ,,la geografía en el Perú de la Paracoccidiodosis brasilensis ,,restringida hasta ahora a la Selva Amazónica, permite por los ,,casos que salen a la costa o a la sierra confirmar esa posibilidad ,,y hace ver que pueden trascurrir largos periodos de latencia antes ,,de que aparezcan los primeros sintomas de la enfermedad. Hasta ,,ahora no se ha encontrado en la costa un solo caso que no haya ,,estado alguna vez en la selva; algunos estuvieron muchos años ,,antes y por muy corto tiempo" . . . cita el ejemplo de un señor que vivió dos años en la selva y 27 años despues presentó los primeros sintomas laringotraqueales. Estas consideraciones tienden a establecer la imposibilidad de que algun caso descrito como originado en la costa o sierra, sea autentico.

En 1949 al regreso del doctor JULIO MORALES de la Universidad de Duke donde estudió bajo la dirección de N. CONANT se incrementó el interes por las enfermedades producidas por hongos. En el Hospital Dos de Mayo (Lima) donde rara vez pudo pensarse en procesos a hongos, se generalizó esta posibilidad diagnóstica desde los trabajos de A. NICHO y las observaciones de J. MORALES. Sin embargo se perdió mucho material al no publicarse varios casos encontrados. El hospital mencionado, el principal parahombres como el de Arzobispo Loayza, hospital general de mujeres, presentan con frecuencia valiosas muestras de la Patología nacional desde los frecuentes de Leishmaniasis cutánea, hasta la lepra y las micosis. Tambien debe anotarse que fue MORALES quien por primera vez enseñó el capítulo de Micología en la Cátedra de Bacteriología de la Facultad de Medidina de Lima.

En 1949, MILLY TRONCOSO presenta su tesis ,,Estudia Micológico en las Paradentopatías'' (37) para optar el grado de Bachiller en Odontología. Es un estudio de ochenta muestras de contenido de bolsa paradental, en el que se señala una fisonomía propia tanto de la flora de saburra como de la flora contenida en el paradencio. En esta última *C. albicans* se presenta en un 6 %, mientras que en saburra alcanza un 50 %. Observa igualmente la presencia de *A. bovis* en un 17 %, aunque no consigue cultivos puros.

Entre los años 1949 y 1952 P. WEISS encuentra fuera de sus casos publicados, cinco más de Blastomicosis; dos de ellos proceden de la zona de Chanchamayo; uno de Lamas, otro de Monzón y el quinto con periodos de estadía en la selva (citados por ANIBAL CASAVILCA (10).

En 1951, F. CABIESES, RAVENS & EIDELBERG (8) presentaron a la Sociedad Peruana de Neuro-psiquiatría un caso de meningitis causada por *T. histolitica*. El caso fue fatal. Procedencia; Nazca.

En 1952, GERARDO BOISSET observa un caso de blastomicosis (citado por (10)).

En 1954, S. PEREZ ALVA, S. RODRIGUEZ &O. ZUÑIGA publican el trabajo ,,Hongos del ambiente de Lima, Callao y Balnerarios''. Estudio bioquímico e immunologico de sus alergenos (30). Es el estudio de 14, 120 cepas de hongos correspondientes a 37 generos, con un porcentaje predominante de *Penicilium*, *Hormodendrum* y *Aspergillus*.

Los trabajos que van a ser comentados a continuación corresponden al año 1955, el mas fecundo para el Perú en trabajos de esta naturaleza.

F. CABIESES en el Symposium sobre aspectos neuro-quirúrgicos de las enfermedades infecciosas y parasitarias-infecciones a hongos- (9) se refirió a casos de Blastomicosis y Criptococcosis observados por él, sin entrar en mayores pormenores.

C. ARELLANO & GALVEZ B. presentaron al segundo Congreso Nacional de Medicina el importante trabajo ,,El agente etiológico de la fiebre de Tingo María'' obra publicada después en los Anales de la Facultad de Medicina (3). Este trabajo significó el epilogo de una inquietante incognita surgida años atras alrededor de una enfermedad que se sabía, era contraida por algunas personas que visitaban la zona de Tingo María (Huánuco) y de preferencia en aquellas que entraban a cuevas habitadas por aves, comunmente lechuzas, de allí que la enfermedad se haya llamado tambien ,,fiebre de las cuevas". El interés por desentrañar este misterio dió lugar a repetidas excursiones, siendo una de las más recordadas la del médico VICTOR AYULO; tanto él como otros excursionistas presentaron tiempo después una fiebre prolongada sin causa explicable; según AYULO el agente era probablemente una *Ricketsia.* Sin embargo diversas circunstancias guiaron a los médicos del Hospital de tuberculosos ,,Bravo Chico" a investigar Histoplasmosis en estos enfermos. En el informe de ARELLANO & GALVEZ BRANDON se da cuenta de que en cuatro de cinco excursinistas examinados la reacción de histoplasmina era positiva y en esputo de dos éllos se aisló Histoplasma capsulatum, deduciéndose que era un hongo el agente etiológico de la antes misteriosa fiebre. Este trabajo dió origen a otros encaminados a completar los estudios, y asi, LAZZARUS & AJELLO (17) consiguieron el aislamiento del hongo en tierra proveniente de las famosas cuevas, donde el ave *Steatornis caripensis* es abundante. Paralelamente el doctor OSCAR RONDON, médico del Instituto Nacional de Salud Pública (33) partiendo de muestras obtenidas en gallineros de Tingo María, ya fuera de las llamadas ,,cuevas de las lechuzas", consiguío aislar el hongo. Esto vendría a explicar con más claridad el alto porcentaje de reactores positivos distribuidos por igual en area rural y urbana en Tingo María segun comunicaron PEREZ LAGOS (31) y VILLA, PEREZ LAGOS & VARGAS (38) quienes encontraron un 43 % de reactores positivos entre los pobladores de esa localidad.

A. BOURONCLE, por su parte comunica un 37 % para Iquitos y 24.7 % para el Callao. El sostiene que las regiones de la selva y los contrafuertes andinos son zonas de endemicidad (5).

Este tema que llegó a apasionar fue motivo, como se verá después, de tres tesis de Bachillerato presentadas en 1957 a la Facultad de Medicina. Tambien en 1955 T. ELMORE, L. EGUREN & J. PACCINI (12) describen un nuevo caso de Blastomicosis en un paciente procedente de Iquitos, al que trataron con Gantrisin, obteniendo buenos resultados.

J. MORALES & O. ROMERO (22) publican en esta misma temporada ,,Cinco nuevos casos de Blastomicosis sudamericana". Dos de éllos son dudosos por no haberse cultivado el hongo a pesar de pruebas repetidas. El ensayo terapéutico en tres de éllos con el Gantrisin, dió un buen resultado. Los lugares de procedencia son, Huanta (depto. de Ayacucho) Monzón, Oxapampa e Iquitos. A. CASAVILCA en su tesis "La Blastomicosis Sudamericana en el Perú-Revisión de todos los casos diagnósticados en el Perú" (10) refiere historias de pacientes provenientes de Tingo María (dos), San Ramón y Oxapampa. Revisa un total de 18 casos hasta 1955. Debemos advertir que en los trabajos de A. NICHO (25) y en el de WEISS & AGUILAR (42) se consigna un mismo caso de Esporotricosis (el procedente de Cajamarca). Ocurre igual con dos casos de

Blastomicosis descritos por MORALES-ROMERO (22) y por CASAVILCA (10). La razón es que estos pacientes han sido vistos aisladamente por estos profesionales, quienes llegaron a iguales diagnósticos e hicieron publicaciones por separado.

Todavía en 1955 H. MIRANDA (20) publica el primer caso peruano de Cromoblastomicosis con lesiones en el dorso de ambas manos, causada por *H. pedrosoi*. El ensayo terapéutico con Gantrisín consiguió limpiar las lesiones según se observó ulteriormente. Este paciente procedía de Trujillo. Aficionado a la caza entre arbustos espinosos. Estadiá en Iquitos dedicado a trabajos de oficina). Poco después el doctor MORALES encontró otros casos de Cromobastomicosis, que no llegó a publicar, aunque los expuso brevemente con motivo de homenaje rendido al Prof. Dr. WEISS por sus 30 años de labor médica. (24)

En 1956 se desarrolló un Symposium sobre Histoplasmosis, publicado por la Revista del Viernes Médico, en el que tomaron parte ARELLANO (4) GALVEZ BRANDON (13); A. BOURONCLE (6) y D. GARCÍA R. (15) J. MORALES presentó este año su ,,nota sobre un caso de Tinea nigra causado por *Cladosporium wernecki* (23). Procedencia: Concepción (Junin). Señala el autor exito terapéutico con lugol topico y oral. En su bibliografía señala un caso similar observado por POLINESTOR AGUILAR y que no se publicó.

H. MIRANDA (21) en Trujillo observó un caso de Esporotrichosis del brazo de tipo linfatico. Luego de un tratamiento de diez días con lugol oral y Furasin tópico en la lesion inicial que asentaba en mano, procedió al drenaje de cada uno de los nodulos con eliminacion de sustancia purulenta, consiguiendos e una rapidísima evolución del cuadro, el que fue perdido de vista a los 28 días de tratamiento, en que practicamente no tenia nódulo alguno y la lesión original estaba cicatrizada. Paciente de 10 años de edad. procedente de una quebrada de Santiago de Chico (Inedito).

El mismo autor dirigió la tesis ,,Hongos ambientales, en la ciudad de Trujillo'' presentada por ROSA YAURI (43) con clasificación de 972 colonias en 15 generos con predominio de *Penicillium*, *Hormodendrum* y *Aspergillus*. En Lima JOSÉ HUAPAYA, presentó la tesis ,,Dermatomicosis combinada (16). El propósito fundamental de este trabajo fue el de investigar la presencia de más de un hongo patógeno en lesiones de la piel; consiguió tres casos de esta naturaleza en 160 positivos sobre un total de 500 portadores de enfermedades de la piel en general. Señala de paso el predominio de *T. tonsurans*, *M. canis* y *T. rubrum*.

En 1957 fueron presentados a la facultad de Medicina de Lima las tesis de GARAYAR (14), OBLITAS (28) y SALAZAR (34) que son expresión del interes surgido por el estudio de la Histoplasmosis a raiz de los estudios realizados sobre ,,la fiebre de Tingo María''. Oblitas en 1.000 individuos de la armada señala un 7.6 % de reactores positivos a la histoplasmina. Estos casos proceden de San Martin, Loreto, Tumbes, Cuzco, Cajamarca, Piura, La Libertad, Lambayeque, Ancash, Callao, Lima y Arequipa. Señala un alto porcentaje en San Martin y Tumbes (Zarumilla). En el Callao encuentra solo un 2.38 % que está mas cerca de la realidad que la señalada por BOURONCLE (5) que dá un 24.7 % para esta localidad.

R. SALAZAR revisó las imagenes radiográficas en 22.171 casos que acudieron por despistaje de T.B.C. a los dispensarios de Lima. Encuentra 19 casos con radiografías caracteristicas de Histoplasmosis. La reacción respectiva en estos sujetos fue intensamente positiva. Se señala como procedencia de éllos: Tingo María, Huanuco Iquitos, San Martin y Amazonas.

Debe mencionarse igualmente, que RAFAEL ACOSTA, médico del laboratorio del Dos Mayo ha encontrado varios casos nuevos de Blastomicosis aun no publicados.

Esta revisión permite apreciar que practicamente la totalidad de los casos mencionados han sido diagnosticados en Lima a excepción de los observados por HERNAN MIRANDA en Trujillo (Norte del Perú). Tambien es notorio que gran parte de éllos han sido motivo de tesis. No debe olvidarse que apreciable número de casos clinicos y con comprobacion de laboratorio han dejado de ser publicados.

En cuanto a Micología en vegetales, PEREZ ALVA y colbs. mencionan los trabajos de CONSUELO DE SEGURA sobre agentes de de citricos paltas y papas (35) (35a) (35b). Tambien se menciona el trabajo de LILIA RETES CAYCHO (32) que estudia la flora micológica en pantanos, jardines, y arena de playa y el de ZELMIRA LEON (18) que hace un estudio de 153 cepas de contaminantes.

En Micología animal A. CUBA CAPARÓ (11) encontró un caso de Rhinosporidiosis en una mula importada de la Argentina. No hay noticias de casos de origen peruano. Señaló este autor la frecuencia de Actinomicosis en ganado vacuno y ovino. No hay al respecto obra escrita.

Bibliografia

1. AGUILAR, POLINESTOR, Estudio Botánico y clínico de las tiñas en el Perú, Tesis, 1948.
2. AGUILAR, POLINESTOR, Estudio botánico y clínico de las Tiñas en el Perú Rev. Med. Exp. Vol. **VII**, N⁰ 1, 2, 3, 4, dic. 1948, pag. 75.
3. ARELLANO, CELSO & GÁLVEZ BRANDON, J., El agente etiológico de la fiebre de Tingo María-Anal. Fac. Med. Vol. **XXXVIII**, 2⁰ p. 1955, pag. 1,092—98.
4. ARELLANO, CELSO, Histoplasma capsulatum, Rev. Vier. Med. Vol. **VII**, N⁰ 1, pag. 29, ene. mar. 1956.
5. BUORONCLE, ALFONSO, Sensibilidad a la Histoplasmina en algunas localidades del Perú-Ana. Fac. Med. Vol. **38** - 2⁰ p. - 1955-pag. 1,099-1,109

6. Bouroncle, A; Epidemiologîa de Histoplasmosis en el Perú- Rev. vier. Med. Vol. **VII**, N⁰ 1, pag. 43.
7. Boysset, Gerardo, citado por Casavilca (10).
8. Cabieses, F., Ravens, J. R. & Eidelberg, F., Meningitis por *Torula histolítica*. Rev. Neurosiquiatria, Vol. **XIV**, 1951, pag. 190.
9. Cabieses, F., Symposium sobre aspectos neuroquirurgicos de las enfermedades infecciosas y parasitarias, Infecciones a hongos, Lima, enero 1955 (1⁰ Congreso Panamericano de Cirugía).
10. Casavilca, Anibal., La Blastomicosis sudamericana (Paracoccidiodosis brasilensis) en el Perú, Presentación de cinco casos nuevos, Revisión de todos los casos diagnosticados en el Perú, Tesis Bach. 1955.
11. Cuba Caparó, Alberto, communicación personal.
12. Elmore, T., Eguren L. & Paccini, J., Consideraciones sobre un caso de Paracoccidiodosis, Rev. San. Mil. del Perú, N⁰ 79, pag. 29, 1955.
13. Calvez Brandon, J., Algunos aspectos de la Immunidad en Histoplasmosis Rev. del Vier. Med. Vol. **VII**, N⁰ 1, ene. mar., 1956, pag. 14.
14. Garayar Ferreira, Ludomilia, Algunas consideraciones sobre Histoplasmosis, Tesis Bach. 1956.
15. García, Ovidio, Clínica de la Histoplasmosis, Rev. Vier. Med. Vol. **VII**, N⁰ 1, ene. mar., 1956, pag. 1.
16. Huapaya, José, Dermatomicosis combinada, Tesis Bach. 1956.
17. Lazzarus, A. S. & Ajello, L., (Inst. Nac. de Hig. y S. P. Lima) Aislamiento de Histoplasma capsulatum del suelo de una cueva en el Perú, Rev. Med. Exp. Dic. 1955, Vol. **IX.**
18. Leon Zelmira, Tesis Fac. Farm. y Bioq., Lima, Perú, 1952 (cit. 30).
19. Mayorga, A. J. M., Tratamiento de Tinea pedis con el ácido, undecilico, Tesis Bach., Lima, 1947.
20. Miranda Hernán, Sobre un caso de Cromoblastomicosis observado en el Norte del Perú, Arch. Per. Pat y Clin. Vol. **IX** N⁰ 1, 1955.
21. Miranda hernan, Esporotricosis de brazo (Inedito).
22. Morales Julio & Romero, Oscar, Cinco unevos casos de Blastomicosis sudamericana diagnosticados en Lima., Arch. Per. Pat. y cli. Vol. **IX**, N⁰ 1, 1955.
23. Morales Julio, Nota sobre un caso de Tinea nigra causado por *Clanosporium wernecki*, Rev. Med. Exp. Vol. **IX**, pag. 53—58, 1956, Lima.
24. Morales Julio, comunicación personal.
25. Nicho, Alfonso, Contribución al estudio de las micosis profundas en el Perú, Tesis, 1948.
26. Nicho, A., Contribución al estudio de las micosis profundas en el Perú, Arch. Per. Pat. y Clin. Vol. **II**, N⁰ 4, dic. 1948.

27. NICHO, A., ZAVALETA, A., Micetoma del brazo y de la pelvis, Arch. Pat. y Clin. Vol. **II**, Nº 3, 409, 1948.
28. OBLITAS DAVID, Intradermoreacciones a la Histoplasmina y a la Tuberculina en el personal de la Armada peruana, Tesis, 1957.
29. O'HARA, HERBERT-Sobre un caso de pie de madura o Micetoma-Tesis-1945
30. PÉREZ ALVA, S., RODRIGUEZ, S., ZÚNIGA, O., Hongos del ambiente de Lima Callao y Balnearios, Estudio Bioquimico e Inmunologico de sus alergenos, Rev. Farm. y Bioq., Nº 1, pag. 48, mar. 1954.
31. PÉREZ LAGOS, F., Encuesta de intradermoreacción de Histoplasmina en Tingo María, Trabajo presentado al segundo Congreso Nac. de Med. oct. 1955.
32. RETES CAYCHO LILIA, Tesis Fac. Farm. y Bioq. Lima, 1952. (cit. por 30).
33. RONDÓN OSCAR, Communicacion personal.
34. SALAZAR, V., RAUL, Las calcificaciones pulmonares y su relacion con la Histoplasmina, Tesis Bach. 1957.
35. SEGURA, CONSUELO DE, Agentes de las enfermedades en cítricos. C.N.I.E.A. de la Molina-Bolet. Lima 1947 (cit. por 30).
35a. SEGURA, CONSUELO DE, C.N.I.E.A. de la Molina, Bolet. 33, Lima, 1950 (cit. por 30).
35b. SEGURA, CONSUELO DE, C.N.I.E.A. de la Molina, Bolet. 42, Lima, 1951, (cit. por 30).
36. TORRES PINZÁS, S., Actinomicosis pulmonar en el Perú, Tesis, 1946.
37. TRONCOSO MILLY, Estudio micologico de las paradentopatías, Tesis Bach. Odontologia, 1949.
38. VILLA, M., PÉREZ LAGOS, F., VARGAS, R., Intradermoreacción anlaehistoplasminas entre los escolares de Tingo María, Rev. Med. Exper. Vol. **X**, Nº 1, Julio 1956, Pag. 3.
39. WEISS, PEDRO., ZAVALETA, TEODORO, Sobre un caso de Linfogranulomatosis micósica causada por *Blastomyces brasilensis* encontrado en Lima, Actualidad Médica Peruana. Vol. **XI**, p. 442, 1937.
40. WEISS, P., FLORES, L., Nuevos casos de Linfogranulomatosis micósica encontrados en Lima, Rev. Med. Exp. Vol. **VII**, 1, 2, 3, 4, 1—14, 1948.
41. WEISS, P., Geografia de las enfermedades en el Perú, Fasciculo I Costa, Lima, 1955.
42. WEISS, P., AGUILAR, P., Casos de micosis profundas encontrados en el Perú, Rev. Med. Per., AñoX, Nº 227, Lima, nov., 1947.
43. YAURI KHOLER, ROSA, Hongos ambientales en la ciudad de Trujillo, Tesis Bach. Ciencias Biol., 1956.
44. ZAVALETA, A., MACCAGNO, V., NICHO, A., Actinomicosis abdominal, Arch. Per. Pat. y Clin., Vol. **VII**, Nº 3, 429, 1948.

CRITICAL SURVEY OF MYCOLOGICAL RESEARCH AND LITERATURE FOR THE YEARS 1946-1956 IN IRELAND

by

J. Martin Beare, M.D., M.R.C.P. (Lond.)
(*Consultant Dermatologist, Royal Victoria Hospital, Belfast, Consultant Dermatologist, Royal Belfast Hospital for Sick Children*)

(8.XI.1957)

> "The distribution of fungus diseases reflects the distribution of mycologists rather than the distribution of fungi". (Ainsworth)

In any survey of a problem as it affects the whole of Ireland one has to remember that the two countries of Northern Ireland and Eire are separate from all points of view — political, economic, racial, religious and, of course, medical. There is virtually no interchange to-day between Eire and the North. Since I live and work in Belfast, the capital of Northern Ireland, my personal knowledge of ringworm is confined to that part of Ireland and my knowledge of ringworm in the South is obtained from what has been published from there, and to a lesser extent, what I have been told by my medical colleagues who live and work there.

I have no knowledge of any of the deep mycoses having occurred in this country and this survey can therefore be limited to the diseases caused by the superficial fungi. These will be considered in turn.

Microsporum audouini

Like many other parts of the world, Northern Ireland experienced large epidemics of *Microsporum audouini* scalp ringworm towards the end of the 1939—1945 war. The reasons for these outbreaks have never been satisfactorily explained. It is tempting to attribute them to lack of adequate medical and nursing care since (a) civilian doctors and nurses were grossly overworked, (b) facilities for X-ray epilation were not available to deal with cases at a sufficiently early stage to prevent outbreaks, (c) many children were evacuated and this would tend to spread infection. However, the major outbreak in our province actually took place in the small town of Newtownards (population 12,000) situated eight miles east of Belfast and this was **not** one of the evacuation centres since it is too near the main city and it was itself an industrial area liable to air bombardment. Not only that, but the epidemic there did not reach serious proportions and was not a public health problem until 1947 — long after the war. It is certainly not reasonable to blame Belfast for ringworm in Newtownards. We have not found it possible to explain why Newtownards was picked out in this way and why many other similar towns (with evacuated children too) should have escaped. There is no doubt that *M. audouini* did exist in Belfast during and before the war but there were few cases. Yet about 1947 Belfast had a considerable outbreak in two centres of the city (not the most densely populated but they were in the poorer districts).

In July 1948 the health of the province became the responsibility of the Northern Ireland Hospitals Authority who, being greatly concerned with these ringworm epidemics, took immediate and praiseworthy steps to deal with the problem. By instituting routine Wood's light examination of all contacts, strict segregation from school of infected children and X-ray epilation at an early date of all those found these epidemics were brought to a speedy end.

While not necessarily advocating X-ray epilation for every individual child with *M. audouini* scalp ringworm, if one's aim is the larger one of eliminating an organism from a small community such as our own then unquestionably the correct procedure is to sacrifice the occasional individual child and so benefit the community. We did not consider it wise to use the strong arm of the law to obtain parents' consent for X-ray epilation, nor was ringworm made a notifiable disease but since infected children could not go to school nor to a cinema nor even to a barber's shop very few parents failed to co-operate. Of course, the fact that children could not go to school was often regarded by the children themselves as rather a good point and we had trouble from potential mischief-makers who decided that they could "sell" their ringworm to other children to enable them too to be off school. I believe the price at one time rose to sixpence a rub! That little game was stopped by the opening of a school for ringworm children but as epilations were then being carried out at a rate of ten per day it was soon possible to close this school.

There is only one other explanation for these epidemics of *M. audouini* infections which is that some alteration in the fungus itself took place and that a more virulent form of fungus growth existed at that time, but this is pure theory — there is no proof either from clinical experience nor from the laboratory work that this was so.

It has been stated that *M. audouini* ringworm is not really a very highly infectious disease (KLIGMAN had difficulty in infecting his "volunteers"). In the Newtownards outbreak 368 children out of a population of some three thousand under the age of seventeen years were infected which is an incidence rate in the population at the same ages of about 12 per cent (BEARE & CHEESEMAN, 1951). 27.2 % of the male school population was infected compared with 7.2 % of the corresponding female population. These figures alone refute the argument but figures relating to an outbreak in a residential school (WALBY, 1952) where 30 % of the school population of about 350 were found to be infected are really quite frightening. In one particular dormitory in this school every one of 30 children had scalp ringworm when examined. There are very few diseases with such a high infectivity rate as this.

Looking back we now know that our ringworm troubles in Belfast were really due to this reservoir of infection in this residential school within the city boundary. These children were being sent out to foster parents and occasionally back to their own parents after a time in this school and during this time they were infected with *M. audouini*. The result was repeated small outbreaks in the areas where the children came to live. Once the main source was eliminated the outbreaks died out. Although most of the work with *M. audouini* in Northern Ireland was done in 1948 to 1950 another few years elapsed before it became rare to see these infections (see Table I).

TABLE I

Incidence of Microsporum canis and Microsporum audouini in Belfast
1953—1956

Date	*M. canis*	*M. audouini*
1953	19	7
1954	14	4
1955	10	1
1956	6	0
Total . . .	49	12

Now it is true to say that we do not see these infections in children except in those who have been infected elsewhere and who have brought their infection back to this province. For this reason continual awareness is necessary to avoid further outbreaks.

It has been possible to eliminate *M. audouini* from Northern Ireland and the following is a summary of the methods which were found to be of value:

(1) Examination (several times) of all school and family contacts using Wood's light and not relying on clinical inspection since so many trivial infections (little more than patchy dandruff) are difficult to detect with the naked eye, yet act as carriers of infection.

(2) Strict segregation of all infected children. Recently we have admitted to hospital any children found with *M. audouini* scalp infection — then the scalp can be kept covered with a sticky ointment and a cap and spread of infection to other children in the hospital is not likely.

(3) X-ray epilation at an early stage, preferably on the day when the child attends the out-patient department (there is no need to wait for laboratory confirmation of the diagnosis — see later).

Between May 1949 and July 1950, 1004 patients with tinea capitis had been seen and the results collected and analysed (BEARE & CHEESEMAN, 1951).

These cases were made up as follows:

Microsporum audouini	806
Microsporum canis	85
Microsporosis (culture not made)	66
Trichophyton discoides	16
Trichophyton sulphureum	21
Trichophyton mentagrophytes	4
Trichophyton equinum	2
Trichophyton schonleini	1
Kerion (culture not made)	3
Total	1004

Since the differential diagnosis of *M. audouini* and *M. canis* scalp infections is so very important and since it is generally appreciated that *canis* infections do not require X-ray epilation we concentrated on an attempt to differentiate between these two infections. We believe that the following six points are the most helpful.

(1) Plotting on large scale map the homes of the infected children since it soon became apparent that whereas our canis infections occurred haphazardly in all parts of the city, *audouini* infections were fairly well localized to specific areas and as the data amassed the charting of each new case gave a strong pointer to the type of infection present.

(2) A more severe infection occurs with *canis* cases than with *audouini* but it had to be remembered that 50 % of *canis* infections show little or no reaction.

(3) *M. canis* infections under Wood's light though they may be just as brilliantly fluorescent at the onset rapidly lose their brilliance and after an average of a few weeks the fluorescence is dull green. *M. audouini* infections do not lose this brilliance for some months.

(4) In addition to this more rapid loss of brilliance *M. canis* infections undergo their cycle of visible changes more rapidly than do *M. audouini* infections. The duration given for an infection is therefore important since a short duration and the appearance of an old microsporosis capitis would suggest *M. canis* rather than *M. audouini*.

(5) In about threequarters of our cases of *M. canis* infections we were told that a kitten in the house was suffering from a skin disease.

(6) Associated tinea corporis is without doubt more common with *M. canis* infections than with *M. audouini* infections.

This hypothesis was put to a practical test and of 100 consecutive cases of microsporosis capitis from the Belfast area 13 were picked out as probably due to *M. canis* and this was proved by culture to be correct in all of them. Three of the cases which were thought to be due to *M. audouini* turned out to be *M. canis* infections, in other words, the diagnosis was correct in 97 out of 100 cases.

As mentioned earlier and as emphasized by practically all authors the Wood's light test is of remarkable value and specificity in the diagnosis of *microsporum* scalp infections. The decrease in the brilliance of the fluorescence as infection clears spontaneously has been described a number of times but non-fluorescent infections due to *microsporum* must be exceptionally rare. Indeed the rarity of this event is praise indeed for the specificity of the Wood's light test. However, during the epidemic periods that have just been described examples of non-fluorescent *M. audouini* and of non-fluorescent *M. canis* scalp infections were observed. It was felt non-fluorescence may be confined to avirulent types of infection and the available evidence suggested that differences in the host rather than in the fungus were responsible for these minimal infections (BEARE & WALKER, 1955).

The management of the common varieties of scalp ringworm was summarized in a paper published in 1954 (BEARE) and the whole problem of ringworm in Northern Ireland was dealt with in a report to the Northern Ireland Hospitals Authority in May 1952 (BEARE & CHEESEMAN).

With regard to the Republic of Eire, apart from the fact that cases known to have been infected there are occasionally seen in Northern Ireland there have been several reports, including two by MEENAN, indicating the importance of *M. audouini* as the cause of tinea capitis in Dublin. MEENAN (1951) gave details of organisms isolated from 87 cases obtained from Dublin and Cork. Of the 87 cases, 31 were *M. audouini*. MEENAN (1955) stated that tinea capitis is endemic in Dublin city; "it is a common but unwelcome sight in the dermatological out-patient departments of the city hospitals". 103 cases were cultured, of these 41 were *M. audouini*. These 103 cases represented 81 separate outbreaks of tinea capitis affecting 72 families and 9 institutions. *M. audouini* was responsible in 29 of the outbreaks.

Microsporum canis

In 1953 (BEARE & CHEESEMAN) we were able to review 59 cases of *Microsporum canis* scalp infections, 40 of these boys and 19 girls.

The fungus has always behaved in the characteristic manner of producing small isolated outbreaks of a few cases, seldom more than 6 to 10. Like *M. audouini* infections there may be little or no inflammatory reaction. About half of the cases which we have seen had no such reaction. In the other half there was an inflammatory reaction frequently of great severity but a common appearance was for a rather dirty or untidy lesion somewhat resembling impetigo but with associated partial alopecia. The presence of fluorescence in Wood's light is of great diagnostic help. The majority of cases of scalp infection due to *M. canis* also have one or more body lesions. It is curious that in the North of Ireland practically all our cases have originated from kittens or cats and seldom from dogs. It may be that an occasional child will spread his or her infection to another child, but in a recent study in the North of Ireland of a single and rather large outbreak of infection due to this fungus, LAWSON & McLEOD (1957) described 8 adults and 14 children who got their infection from a series of kittens and dogs, who in turn were infected by a single Persian cat introduced sometime previously into a local cattery. In this outbreak no cases of child transmission were noted and no further cases occurred after the infected kittens and cats had been destroyed and it was felt that every single infected child or adult had actually acquired his or her infection direct from an infected animal. Though this work is of recent origin, yet it had always been our view that child to child transmission of infection was rare compared with the probability that infected humans really got their infection directly from the animals concerned. This has been postulated in a series of papers by LA TOUCHE (1955 and 1957) and indeed in common with THOMAS (1953) we have not been keeping our infected children from school if we thought it was possible for some minor precautions to be taken, for example, children should not play together if ringworm is present in one of the children, but there seems no reason why an infected child should not sit beside another in the same schoolroom.

It should be noted that X-ray epilations for *M. canis* scalp infections have not been carried out here for some time apart from a few isolated incidences when the infection was entirely non-inflammatory and when spread among other children in the household seemed likely to occur for want of adequate parental supervision. Indeed in this regard one can say that we have seldom seen ringworm of the scalp due to *M. canis* last for longer than six months even in the complete absence of any treatment. It is, of course, important for all contacts with an infected child to be examined under Wood's light and clinically (in view of the fact that body lesions are common) but by far the most important thing which one has to do is to eliminate the animal reservoir, so that in practice it is really more important to examine with Wood's light kittens and dogs in the household than to examine the child's friends at school and in the home.

We have learnt recently of the importance of ringworm due to *M. canis* in the adult. It had been thought by many, including ourselves, that this was nearly always a disease of childhood and of young animals but in the last year or two we have realized the great importance of the infected adult. This has been pointed out in the paper from the North of Ireland by LAWSON & MCLEOD (1957) and also in an important paper from Scotland by GENTLES & O'SULLIVAN (1957). The remarkable tomcat described by LAWSON & MCLEOD was actually responsible directly for infecting 6 other animals (4 cats and 2 dogs) and indirectly 22 humans (14 children and 8 adults). This was a very high percentage of all exposed, the infectivity rate being 93 % of the children exposed and 27 % of the adults exposed.

M. canis is also responsible for considerable ringworm in Eire. MEENAN (1955) found 47 cases of *canis* infection in the 103 which he examined and he stated that "*M. canis* accounts for at least 50 % of all cases of tinea capitis in Dublin". In his other paper MEENAN (1951) found *M. canis* to be responsible for 8 cases of tinea corporis and 34 of tinea capitis. YOUNG (1956) described a male Irish terrier aged one and a half years which developed ringworm and in turn infected human contacts. This dog's claws were infected and the infected ones were of a light brown colour in contrast to other claws which were much darker. There was fluorescence under Wood's light not only of hair but also of claws. This author points out that chronic cases common among cats are not likely to be seen among dogs where the infection takes on a more acute course. Onychomycosis in cats and dogs must be quite rare but is obviously of some importance. Infection of cats' claws has been described by LA TOUCHE (1955).

Trichophyton sulphureum

With the disappearance of *M. audouini*, *Trichophyton sulphureum* has taken its place as the most important type of the human variety of ringworm in childhood in this province and in 1956 (BEARE) it was possible to review a total of 82 cases of scalp ringworm due to this fungus. *T. sulphureum* is included in the large group of fungi known as *Trichophyton tonsurans*. The 82 cases were made up of 45 boys and 37 girls and most of these cases were found within large centres of population, particularly in Belfast. It is interesting that this organism should have affected our province almost at the same time as it has become important in various other localities in the world, for example, HOWELL et al. (1952) discuss 44 cases of tinea capitis due to *T. tonsurans* in Texas and California and FOX & RUSH MUNRO (1953) describe 9 cases from New Zealand. Recently WHITTLE (1956) reported 7 childhood infections in the Cambridge area. We had already seen 21 cases of tinea capitis due to this fungus in Northern Ireland when we reported in 1951 (BEARE & CHEESEMAN). The problem has also been discussed recently by CHERNOSKY et al. (1956) and by KRAFCHUK (1957). Our own findings in this large series of 82 scalp infections have not differed from those reported by others. The clinical appearances are most variable. Of the 82 cases 23 showed severe inflammatory reaction (kerion) and 10 of these were particularly severe. Of the remaining 59, there was no reaction at all in 44 and a slight erythema with a mild folliculitis in 15. Infections showing a relatively non-inflammatory type of reaction were often exceedingly difficult to diagnose. Frequently the patches were tiny with only an occasional broken-off hair which lead one to suspect ringworm at all. Sometimes differentiation on purely clinical grounds between this infection and mild patchy seborrhoeic dermatitis was impossible. Rarely a "black dot" appearance was present. The regular breaking off of hairs at approximately one-eighth of an inch above the surface found classically in *microsporum* infections is not always seen with *T. sulphureum*. Skin within this patch may be normal or may show various degrees of inflammatory change. Usually however scaling is present. Added to these difficulties of clinical diagnosis is the fact that there is no fluorescence in Wood's light, although affected hairs will often appear dull and can be distinguished from normal hair. It seems likely therefore that a large number of mild scalp infections due to *T. sulphureum* are not recognized, partly from failure of the doctor to make a correct diagnosis and partly from a mother not noticing anything wrong with her child's scalp. These cases will act as carriers of infection.

Of the 10 severe inflammatory cases, 3 were of particular interest since the reaction changed from non-inflammatory to severely inflammatory after an appreciable delay. The delays in our 3 cases were 8, 11 and 13 weeks. Since it seems likely that the reaction produced by a fungus on human skin is largely of the hypersensitivity type so that 10—14 days would normally be required for this reaction to develop, it is indeed most curious that we should have witnessed delayed reactions of as much as 8 to 13 weeks.

The difficulties in management and in treatment are considerable. X-ray epilation is certainly indicated in extensive non-inflammatory cases but watchful expectancy with anticipation of spontaneous cure, probably within a year, seemed to be the most logical treatment for insignificant non-inflammatory patches. The development of kerion, of course, hastens cure. Though accurate figures are not available it is certainly our impression that tinea corporis due to *T. sulphureum* is just as common as is tinea capitis due to this organism. However, most of the cases seen have been of the non-inflammatory and almost insignificant type and it is very likely that these mild body lesions act as carriers of infection to other children, who in turn may, if they are unfortunate, develop a scalp lesion.

With regard to Eire, it would seem that *T. sulphureum* (*tonsurans*) is an important fungus in that country too. MEENAN (1955) found this organism 15 times in 103 cultures and it was responsible for 14 of his outbreaks, including 7 institutions. MEENAN gave as his opinion that "epilation is always necessary" and "once *T. tonsurans* gets into an institution it is practically impossible to stamp it out". One feels that this may be unnecessarily pessimistic but undoubtedly it is always difficult.

We are hopeful that this year (1957) the incidence of *T. sulphureum* (*tonsurans*) in the North of Ireland may already be dropping. Not that it was ever dangerously high, our worst year being in 1952 when we had 20 cases of tinea capitis and about an equal number of tinea corporis, but the absence of Wood's light as a diagnostic tool and the great difficulties in making a clinical diagnosis lead one to worry that here could be a problem which might readily get out of hand and cause large scale epidemics. The measures which have been taken seem to be all that one can do under the circumstances. They have been as follows:

(1) Clinical inspection of all school and familial contacts with known cases.

(2) Microscopic and cultural examination of any possible infections of the scalp or body if *T. tonsurans* was suspected.

3) Epilation with X-rays of extensive scalp infections at the earliest possible date.

(4) Isolation in hospital of cases which had been epilated if there was any question that the home conditions were not good or if the children came from an institution. When in hospital the children's scalps are covered with a greasy fungicidal ointment and a cap.

(5) Treatment using a fungicide of known repute of all trivial scalp lesions and of body lesions and cover of these lesions with occlusive dressings.

(6) Adequate follow-up of infected cases until clear.

Trichophyton discoides

There always has been and there probably always will be cattle ringworm in Ireland. It is an agricultural country where, particularly in the western districts, farms are small and farmers relatively poor. The byres in which the cattle are kept are usually of poor standard. Ringworm in cattle has no economic importance whatsoever to the farmer and so there is little inducement for him to try and eliminate the infection, even if he could, from his farm. It is known that attempts to eliminate ringworm from horses in racing stables have been made and yet here when the economic factor was always of considerable importance little success has been achieved. Yet so common is *T. discoides* (*verrucosum*) that it is very probable that every farm-worker in the western parts of both Northern Ireland and Eire will get ringworm at some time or another in their lives. Those who are lucky will acquire an infection of the non-hairy skin, those who are very unlucky will acquire an infection of the beard. In 1953 Beare & Cheeseman had 15 patients with tinea capitis due to *T. discoides* but it was pointed out that this represents only a tiny proportion of the amount of ringworm which there is due to this fungus in the province. It is so common that seldom are cases referred to a consultant unless they are of unusual severity. Tinea capitis is only seen in children, tinea barbae is common in farm workers; lesions on the hands, arms and legs are common in both sexes at all ages. The author has not yet seen any example of *T. discoides* ringworm occurring twice in the same patient, though second attacks of ringworm due to fungi different from those responsible for the first attacks have been seen. It would seem then that some immunity mechanism is at work, not only to produce a spontaneous cure but also to provide a longlasting immunity to re-infection. In view of the considerable inflammatory response which is inevitable with *T. discoides* this is not unexpected. The importance of the infection is obvious enough. The lesions are usually painful, children may suffer from some degree of toxaemia, admission to hospital is frequently advisable, adults may be out of work for considerable periods. Treatment is conservative, except for the manual epilation of loose hairs which contain fungus elements. Frequent application of starch poultices are not only soothing but also help in the removal of these loose hairs which stick to the undersurface of the poultice. The disfiguring scars which follow can often be improved by simple excision of the affected area or by surgical grafting.

The ringworm charmer is still an important therapist in the North of Ireland and I believe also throughout Ireland. Solomons (1957) quoted a doctor in Galway as having said that 90 % of cases of cattle ringworm there were treated by local cures. Since *T. discoides* will always cure itself spontaneously and since the inflammatory reaction reaches a maximum within 10—14 days the charm is certain to be followed by some improvement. It might be said indeed that the charmer is "batting on a plum wicket". The most popular charm is to wait for a new moon, then to remove a small twig from the hedge, burn and wave it (without touching the skin) three times round the area of ringworm; cure follows.

The difficulties of eradicating *T. discoides* mycelium and spores from byres and scratching posts used by cattle infected with ringworm are apparent, particularly when one remembers that the spores have been shown to survive for 15 months or longer, that they have been found to grow on sterilized soil and cow dung (Walker, 1955). This point is also made by Solomons (1954).

Solomons (1957) sent 830 questionnaires concerning cattle ringworm to doctors in every country in Eire except Dublin. He received 315 replies. These questionnaires revealed that 40 % of cases occurred in the springtime, 27 % in the winter, 14 % in the summer and 18 % in the autumn. The average doctor would expect to see more than 8.8 cases per year and in County Mayo the average number of cases per doctor per year would be as high as 18.6. It was estimated that the common age incidence would be between 10 and 20. Almost 40 % of cases were affected on the arms, forearms, wrists: 30 % on the hands and 28 % on the head, scalp, face or neck. *T. discoides* is the common pathogen but *Trichophyton mentagrophytes* accounted for 5 % of SOLOMONS' positive cultures. GENTLES & O'SULLIVAN (1957) report isolating *Trichophyton verrucosum* (*discoides*) on two occasions from dogs in Scotland. We have not found this organism in any animal other than a cow or calf.

Trichophyton mentagrophytes

In 1953 we described eight cases of tinea capitis due to this organism and indeed we have seen very few cases since then. We thought at that time that the organism originated from infected cattle but recently have had considerable doubt in this matter, especially when one remembers that *T. mentagrophytes* is almost entirely confined to the city of Belfast. Further doubt on this idea was expressed by GENTLES & O'SULLIVAN (1957) in which they were able to quote a single isolation of this organism from cattle and in a review from the West of Scotland by the same authors, their only case of *T. mentagrophytes* linked a boy with his pet mouse which had cultural but no clinical evidence of ringworm. The lesions in general are inflammatory and of the same type but not quite so severe as *T. discoides*. MEENAN in his two reviews (1951 and 1955) does not mention isolating *T. mentagrophytes* in Eire.

Other uncommon dermatophytes

(a) *Trichophyton Equinum*

This fungus of low infectivity to man and a parasite of horses was found to be responsible for two cases of tinea capitis seen in Northern Ireland in 1949. There was little or no inflammatory reaction and, of course, no fluorescence under Wood's light. No cases have been seen since. The disappearance of horses from the city and the countryside will no doubt make it unlikely that we will see much more ringworm due to *T. equinum*.

(b) *Trichophyton Schonleini*

One case of infection of the arm was seen and described in detail in 1951 (BEARE & CHEESEMAN) and a more typical scalp infection was noted in 1953 (BEARE & CHEESEMAN). A number of cases of favus were seen in the North of Ireland before 1939 and two cases were treated in the Belfast City Hospital by Dr. REGINALD HALL in 1948. The child seen by us and described in 1953 was a mentally defected boy, a cousin of the original two cases. There was motheaten alopecia on the top of the scalp but there were no clinical scutulae. Under Wood's light there was blue-green fluorescence. No cases of favus have been seen since then as far as I am aware. MEENAN does not mention having isolated *T. schonleini* in Dublin.

(c) Of the other dermatophytes, *Trichophyton violaceum* and *Microsporum gypseum* have been isolated in both the North of Ireland and in Eire but they are uncommon.

Tinea Pedis

The common causes of tinea pedis in the North of Ireland are *Trichophyton rubrum, Trichophyton interdigitale* and *Epidermophyton floccosum*. The condition is not common, the majority of cases have been infected abroad usually in the Middle East or Far East and the condition as seen in the temperate climate of the North of Ireland is seldom more than of nuisance value. *T. interdigitale* presents a mild maceration between the toes and on the soles of the feet, *T. rubrum* a somewhat more annoying eruption with frequent involvement of the nails; *E. floccosum* is another mild infection as it occurs in our country, frequently the groins are also affected. We have not yet encountered a great increase of *T. rubrum* infections which have been seen in other parts of the world and which are causing worry and concern in England.

In a very good article MEENAN (1953) examines critically previous work done on the subject of tinea pedis. He states that only about 10 % of all cases referred to skin clinics as tinea pedis are really true infections. He points out that there are three methods for diagnosing the condition, namely, clinical examination, microscopic examination and culture and that the discrepancy between clinical and laboratory findings is remarkable. He examined a hundred students between the ages of 20 and 30. These cases were completely unselected. None of them were complaining nor had any come for treatment, and no one was suffering from a concurrent skin lesion which could be related to the condition of their feet. 93 of these cases presented clinical signs compatible with a diagnosis of tinea pedis. In 7 cases the interdigital skin showed no sign of any abnormality but in all the others there were some signs of scaling or maceration in one or other interdigital space. In 24 these signs were minimal. 10 showed marked signs of infection with maceration and fissuring in most of the interdigital spaces. Direct microscopic examination of scrapings yielded a positive culture in 2 cases and one of these two was from the group of 10 classified as severe on clinical grounds. Fungus was extremely scanty. The other case was from the group classified as mild and fungus was plentiful. The socalled mosaic fungus was found in threequarters of the cases. By cultural methods pathogenic fungus was isolated in 2 cases. One culture was from a case which was not positive microscopically, the other fungus was from the case which showed plenty of fungus microscopically. The fungus grown in each case was *T. interdigitale*.

MEENAN points out that it is clear from a survey of the literature and from his results that the diagnosis of tinea pedis is far from satisfactory in a large number of cases that present classical appearances of fungus infection. The question therefore arises whether tinea pedis is a grossly overdiagnosed condition or whether our laboratory techniques are faulty, but if the latter is true then the clinical signs are out of all proportion to the amount of fungus present and this is an unusual affair except in violently inflammatory kerions. As MEENAN says, "mycological postulates of KOCH are overdue".

Moniliasis

The incidence of moniliasis is not remarkable in Northern Ireland though, as in most other places, it is increasing with the increasing use of antibiotics. The difficulty regarding a classification within the genes *candida* has been examined critically by MEENAN (1956). He points out that there are two methods for identifying *C. albicans*. One is a fermentation method which depends on the fact that the species has characteristic sugar fermentation reactions but this method is time-consuming and difficult. The second method is a morphological one depending on the production of chlamydospores in cornmeal agar. MEENAN considers the morphological method not only easier but also more reliable and he says this is so especially when laboratory facilities and time are limited.

Summary

1. The various types of fungi isolated from cases of ringworm in the North of Ireland during the ten-year period 1946 to 1956 are described.

2. Our own personal experiences in the North of Ireland with these fungi are given.

3. The experiences of colleagues in Eire as represented by their writings are summarized.

Acknowledgments

The author wishes to thank Dr. F. O. C. MEENAN and Dr. BETHEL SOLOMONS for writing and answering various queries about ringworm in Eire.

Bibliography

BEARE, J. M. (1954) Management of the Common Varieties of Scalp Ringworm; Brit. med. J. **1**, 356.

BEARE, J. M. (1956) Tinea Capitis due to Trichophyton Sulphureum Brit. J. Derm., **68**, 193.

Beare, J. M. & Cheeseman, E. A. (1951) A Localised Outbreak of Tinea Capitis (Microsporum Audouini) in Northern Ireland; Arch. Dis. Childhd., **26,** 149.

Beare, J. M. & Cheeseman, E. A. (1951) Tinea Capitis: Review of 1004 Cases; Brit. J. Derm., **63,** 165.

Beare, J.M. & Cheeseman, E.A. (1953) The Problem of Ringworm in Northern Ireland; Ulster med. J. Supplement to Vol. **22,** May 1953.

Beare, J. M. & Walker, J. (1955) Non-fluorescent Microsporum Audouini and Canis Infections of the Scalp; Brit. J. Derm., **67,** 101.

Chernosky, M. E., Friedman, L. & Krafchuk, J. D. (1956) The growing problem of Tinea Capitis due to Trichophyton Tonsurans; Bull. Tulane University Medical Faculty, **16,** 31.

Fox, P. B. & Rush Munro, F. M. (1953) New Zealand Med. J., **52,** 488.

Gentles, J. C. & O'Sullivan, J. G. (1957) Correlation of Human and Animal Ringworm in West of Scotland; Brit. med. J., **2,** 678.

Gentles, J. C. & O'Sullivan, J. G. (1957) The Isolation of Ringworm Fungi from Unusual Hosts; Vet. Rec., **69,** 132.

Howell, J. B., Wilson, J. W. & Caro, M. R. (1952) Arch. Derm. & Syph. Chicago, **65,** 194.

Krafchuk, J. D. (1957) 11th Intern. Congress of Dermatology Transactions, Stockholm.

La Touche, C. J. (1955) The Importance of the Animal Reservoir of Infection in the Epidemiology of Animal Type Ringworm in Man; Vet. Rec., **67,** 666.

La Touche, C. J. (1955) Onychomycosis in Cats infected by Microsporum Canis. Bodin; Vet. Rec., **67,** 578.

La Touche, C. J. (1957) The Epidemiology of Some Fungus Diseases with special reference to Ringworm; Med. Pr., 412.

Lawson, G. T. N. & McLeod, W. J. (1957) Brit. med. J., — in the press.

Meenan, F. O. C. (1951) Ringworm Species in Eire; Irish J. Med. Sc., 546.

Meenan, F. O. C. (1953) The Incidence of interdigital fungus infections in University students; J. Irish Med. Assoc., **33,** 102.

Meenan, F. O. C. (1955) Mycological Aspects of Tinea Capitis in Dublin; Irish J. Med. Sc., 321.

Meenan, F. O. C. (1956) The Mycological Diagnosis of Candida Albicans; Irish J. Med. Sc., 412.

SOLOMONS, B. (1954) Letter to the Editor; Brit. med. J., **2,** 1420.

SOLOMONS, B. (1957) Cattle Ringworm in Eire; J. Irish Med. Assoc., **40,** 90.

THOMAS, B. A. (1953) Microsporum Canis Ringworm and Loss of Schooling; Brit. med. J., **1,** 536.

WALBY, A. L. (1952) Tinea Capitis (Microsporum Audouini) in a Residential School; Brit. med. J., **1,** 1114.

WALKER, J. (1955) Possible Infection of Man by Indirect Transmission of Trichophyton Discoides; Brit. med. J., **2,** 1430.

WHITTLE, C. H. (1956) Brit. J. Derm., **68,** 1.

YOUNG, A. M. (1956) Chronic Diffuse Ringworm due to Microsporum Canis in a Dog involving two claws; Vet. Rec., **68,** 606.

A CRITICAL SURVEY OF MYCOLOGICAL RESEARCH AND LITERATURE FOR THE YEARS 1946-1956 IN AUSTRALIA

BY

E. Beatrix Durie, B.Sc., M.B., F.R.A.C.P.
(*Institute of Medical Research, Royal North Shore Hospital, Sydney, Australia.*)

(26. XI. 1957)

> 'J'ai donc étudié les champignons et, s'ils n'ont pas ému ma sympathie, ils ont du moins forcé mon admiration. Car ce sont des êtres étranges et redoutables'.
> Langeron (1952).

It must be said at the outset that comparatively little mycological research has been done in Australia. Certainly very little work has been done in medical mycology and still less in veterinary mycology. Some plant diseases caused by fungi, notably the rusts of wheat, have been studied extensively, but very little has been published on general mycology. Gilman (1945) includes only three references to the isolation of fungi from Australian soil out of a total of 169 references to the literature. The amount of work in agricultural and soil mycology however has increased greatly since 1945 and will be mentioned below. In the first edition of 'Manual of Clinical Mycology' (Conant, 1944) the incidence of mycotic disease was illustrated by a series of eight outline maps of the world; Australia remained a blank in five of these. However an interest in general mycology and in mycological disease in plants, animals and man is growing and more papers appear each year. Most publications relate to applied rather than to pure mycology; they are records of isolated observations rather than of research projects.

As regards medical mycology there are several reasons for this dearth of research. Australia is a vast continent but very little of it is inhabited; the whole population is only about nine millions. Most of the inhabitants live in temperate zones; comparatively few in tropical or subtropical areas: a relevant point in medical mycology since at least half the known mycoses are much more prevalent in tropical and subtropical climates than elsewhere. The geographical isolation of Australia together with an efficient quarantine service, have kept this continent remarkably free from communicable disease, whether it be bacterial, viral or fungal in origin. The widespread occurrence of *Histoplasma* in soils in the United States; the endemicity of coccidiomycosis in the San Joachim valley, California; the entities known as North American and South American blastomycosis — these things have no counterpart in Australia, as far as we know. It is certainly surprising that neither coccidiomycosis nor — except for three isolated cases — histoplasmosis has been found in this continent. However, it is being realized that Australian medicine has its mycological problems. Diseases with a world wide distribution such as actinomycosis, nocardiosis, moniliasis, cryptococcosis and the dermatomycoses occur here as elsewhere; chromoblastomycosis has been reported, chiefly from Queensland and an occasional case of sporotrichosis occurs. Fungal infections have occasionally followed the use of the broad spectrum antibiotics. So far very little work in medical mycology has been done in the territory of New Guinea; this should provide a fruitful field for the future.

Actinomycosis

Actinomycosis is of world wide occurrence and case reports come from Australia from time to time. (FAIRLEY 1947; ROSE 1948; FINLEX & GARVAN 1949; LOEWENTHAL 1950). Outstanding contributions had been made by GOLDSWORTHY (1937; 1940) before the period under review and in 1947 he published an excellent review entitled 'Actinomycosis with special reference to the cervico-facial type' based in part on experience gained at the United Dental Hospital of Sydney, and in which the theory of endogenous infection is discussed. In a previous paper (SULLIVAN & GOLDSWORTHY, 1940) entitled 'A Comparative Study of Anaerobic Strains of Actinomyces from Clinically Normal Mouths and from Actinomycotic Lesions', the authors stated their belief that 'the organism', i. e. *Actinomyces bovis*' leads a saprophytic existence in the mouth and invades the tissues only when conditions are rendered favourable, as by injury'. LUDWIG (1955) described 'Actinomycosis originating in the Maxillary Region', and also (1955) 'A Study of some filamentous micro-organisms isolated from the human mouth'. The study of actinomycosis is being continued at the United Dental Hospital, Sydney. The disease is not rare in Sydney; 14 cases occurred at the Dental Hospital during the year 1949 and the average annual number of cases for the years 1948—1950 was ten (GOLDSWORTHY, 1957). On the other hand the disease is seldom seen in Melbourne. On the veterinary side BURNS & SIMMONS (1952) described Actinomycotic infection in a horse, caused by an actinomycete 'allied to *Actinomyces bovis*'.

Nocardiosis

Nocardiosis, a name given to infections caused by several species of aerobic actinomycetes occurs throughout the world. Whereas the anaerobic *Actinomyces bovis* has not been found in nature apart from man or animals, aerobic actinomycetes have been isolated from the soil, and may therefore occur as laboratory contaminants. Nocardiosis has not often been recorded in Australia. O'Reilly & Powell (1953) described a fatal case of pontine abscess caused by *Nocardia asteroides*, being the second infection in man reported in Australia. The first had been described by Goldsworthy (1937), who encountered another case later (not reported). The lesion appeared subcutaneously in the thigh following a blow from a pick handle. A fatal case of pneumonia due to the same organism was described by Horsley (1947). Dementjev (1955) described the isolation of *Nocardia madurae* from a granulomatous lesion of two years' duration on the left instep of a twenty-six year old female patient from Jandowae, Queensland. An outbreak of nocardiosis in marsupials (with eight fatal cases) in the Brisbane Botanical Gardens was recorded by Tucker & Millar (1953). Henry (1952) described 'Mycotic Dermatitis or Lumpy Wool' caused by *Nocardia dermatonomus*. Moule & Sutherland (1947) recorded outbreaks of mycotic dermatitis in beef and dairy cattle in Queensland and McTier (1948) described mycotic dermatitis in cattle in New South Wales, (including some beasts from an arid region), caused by *Actinomyces dermatonomus*. Moule (1948) wrote a short note on 'Lumpy Wool in Sheep' due to the same fungus. Harris & Harding (1950) described an unusual outbreak of mycotic dermatitis in lambs and Munch-Petersen (1954) recorded the isolation of *Nocardia* sp. from a bovine udder infection. Seldon (1953) gave a comprehensive account of mycotis dermatitis stating that it was first found in sheep but later shown to affect cattle and horses though not so commonly.

Histoplasmosis

As far as is known only three cases of histoplasmosis have occurred in Australia and limited histoplasmin surveys have not shown any reactors to the intradermal test. The first known case of histoplasmosis in Australia was recorded by Johnson & Derrick (1948). The patient, a man of 51 years, was a farmer in the Orange District of New South Wales, and had never been outside Australia. The fungus was demonstrated in histological sections made from a small tumour of the chin, but no cultures were made. The patient remained free from the disease for four years after the excision of the lesion; his subsequent history is not known. A second and fatal case occurred in Queensland in 1951 and was recorded by Inglis & Powell (1953). The patient, a farmer and meatworker aged 52, lived in North Queensland and had never left Australia. A third case, first noticed in 1952, was described by Dowe, Graham, Brown & Durie (1953). The patient, a man aged 37, had enlisted in the army in 1942. From 1943 to 1946 he served for varying periods in Dutch New Guinea, the Schouten group of islands and in Borneo.

He complained of huskiness and difficulty in speaking and had an ulcer on the tongue. Histological examination of a biopsy of the larynx showed the yeast-like bodies of *Histoplasma* and *Histoplasma capsulatum* was grown from tissue fluid from the tongue ulcer. This patient's skin reacted to Histoplasmin injected intradermally but skin tests performed on his wife and two children elicited no reaction. The patient appeared to improve on treatment with sulphadiazine and has remained well.

Cryptococcosis

The terms torulosis and *Torula histolytica* seem to be preferred to cryptococcosis and *Cryptococcus neoformans* in this country. This disease has a world-wide occurrence. Before the period under review, SAWERS & THOMSON (1935) had published a good review of the subject with a case report. COX & TOLHURST (1946) published a monograph on 'Human Torulosis with a report of 13 cases'. ALDERSON (1949) described two cases of torula meningitis in Central Australia. MCCONCHIE (1951) recorded three cases of torulosis of the lung treated by resection. SUSMAN (1954) recorded a similar case and two further patients were described by FORTUNE and others (1955). BUCKLE & CURTIS (1955) observed two cases in which treatment with 'Actidione' (cycloheximide) was tried. GEANEY, HORSFALL & NEILSON (1956) reported 14 cases occurring in Queensland. Torulosis of bone was observed by DURIE (1954) the lesion being a chronic cystlike abscess of the tibia in a man aged 47 years. CURTIS (1951) recorded a case of torulosis in a domestic cat. Torulosis is more commonly seen in Australia than the above list indicates; cases of this disease are not always recorded in the literature.

Candidiasis

This infection is of world-wide occurrence and in Australia as elsewhere *Candida albicans* may be carried by healthy individuals. Thrush, monilial vaginitis and monilial skin lesions may occur. Since the advent of the broad spectrum antibiotics more serious forms of moniliasis are seen. ANDERSON (1946) published 'A Laboratory Study of Monilia Albicans'. LILIENTHAL & GOLDSWORTHY (1950) working at the Institute of Dental Research, Sydney, recorded the results of studies of the flora of the mouth, with special reference to yeast-like organisms including Candida albicans. DUHIG & MEAD (1951) described four cases of moniliasis in infants of low vitality suffering from enterocolitis. CHRISTIE & MORTON (1953) and MORTON (1955) published studies of the detection of *Candida albicans* and also (1956) a report of three cases of moniliasis. KOVACS (1956) observed a case of septicaemia due to *Candida albicans*. HART (1947) described moniliasis in turkeys and fowls in New South Wales and PEARSON (1951) wrote a paper entitled 'Moniliasis or thrush in poultry'). A general account of moniliasis in birds was given by SEDDON (1953).

Sporotrichosis

CONANT (1954) writes that 'Sporotrichosis has been reported from all continents. In North America the disease appears to be more prevalent in the north central part of the United States; in Europe most of the cases have been reported from France.' No area of high endemicity has occurred in Australia, as far as is known. ROBINSON & ORBAN (1951) described a case of regional lymphatic sporotrichosis; infection had developed as a result of injury to the hand while using manure in the garden. BARRACK & POWELL (1952) described a second Australian case, developing on the right hand and arm following a prick on a finger. MINTY, MEAD & MCCAFFREY (1956) reported a third case. MEAD & RIDLEY (1957) in a survey of sporotrichosis and chromoblastomycosis described three instances of the former disease, two of which were new, bringing the total number from Australia to five.

Chromoblastomycosis

All but one of the cases reported in Australia occurred in Queensland; this is in accordance with the fact that the majority of cases of chromoblastomycosis occur in the tropical and subtropical areas of the world. The first report of chromoblastomycosis in Australia was made by SAXTON, HATCHER & DERRICK (1946), who described two cases of chromoblastomycosis occurring in Queensland. Diagnosis depended on histological examination; no cultures were made. A third case was reported by HICKS (1946). In these three cases the diagnosis rested on the discovery of the characteristic spores in a histological preparation. No cultures were made because the diagnosis had not been anticipated at the time of biopsy. The next communication on the subject was a letter (STEVENS, 1947) stating that chromoblastomycosis was well-known in North Queensland under a variety of names. The writer referred to 36 cases in 4 of which the diagnosis had been confirmed histologically. BARRACK (1952), reviewing his case records, considered that he had seen 40 cases of chromoblastomycosis since 1927. In 12 the diagnosis had been confirmed histologically and in the more recent cases, both histologically and culturally. All had come from rural areas. These early papers served to stimulate interest in the subject of chromoblastomycosis in Queensland', POWELL (1952) published 'A Survey of Chromoblastomycosis in Queensland', dealing with 35 proven cases, including the two reported by SAXTON and others (1946) and two of those reported by BARRACK (1952). In 20 cases cultures were made, and yielded 17 isolates of *Cladosporium carrionii* and two of *C. pedrosoi*. All the patients were males; infection was most common in the 60 to 70 years age grolp; duration was one month to 32 years. Infection was most frequent on the dorsal surface of hands and forearms. Twelve patients gave a history of antecedent local injury.

No clear cut contact with animals or plants was demonstrated but nearly half handled timber. The distribution of chromoblastomycosis in Queensland was shown to extend from Cairns to Texas and from Richmond to the coast (see map). MEAD (1955) recorded a lesion on the knee of an eleven-year old boy. BARRACK (1957) discussed mycotic granulomata in relation to sporotrichosis and chromoblastomycosis. MEAD & RIDLEY (1957) recorded 23 new cases of chromoblastomycosis from Queensland. *Cladosporium carrionii* was

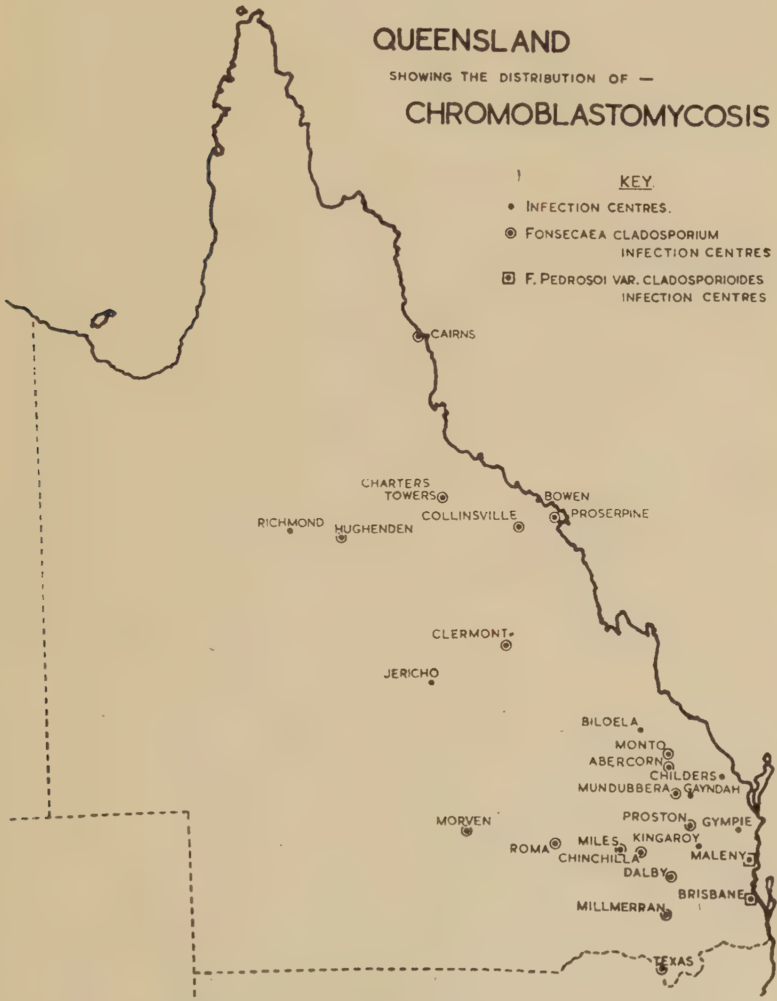

QUEENSLAND
SHOWING THE DISTRIBUTION OF —
CHROMOBLASTOMYCOSIS
KEY.
● INFECTION CENTRES.
◉ FONSECAEA CLADOSPORIUM INFECTION CENTRES
⊡ F. PEDROSOI VAR. CLADOSPORIOIDES INFECTION CENTRES
CAIRNS
CHARTERS TOWERS
BOWEN
PROSERPINE
COLLINSVILLE
RICHMOND
HUGHENDEN
CLERMONT
JERICHO
BILOELA
MONTO
ABERCORN
CHILDERS
MUNDUBBERA
GAYNDAH
MORVEN
PROSTON
GYMPIE
ROMA
MILES
KINGAROY
CHINCHILLA
MALENY
DALBY
BRISBANE
MILLMERRAN
TEXAS

Fig. 1.—Localities where chromoblastomycosis has been found.
From: R. E. POWELL, Austr. J. Dermat. I: 214—222

isolated from 9 cases and *Cladosporium pedrosoi* from one. Two strains of an organism closely resembling *Cladosporium carrionii* were isolated from fence posts in South Queensland and produced lesions in the skin of volunteers. McGeoch & Myers (1954) reported two cases from New South Wales. Durie & Brown (1953) included a case of chromoblastomycosis in a series of cases of fungal infection occurring in hospital practice in Sydney. The culture in question had been sent from New Zealand for identification. The patient, a Chinese, had lived in New Zealand for 30 years. (Hill and others, 1953) MacMillan (1955) described a case of 'localized blastomycosis in a girl of 18. Unfortunately no cultures were made.

Dermatomycosis

Most of the papers reviewed in this section are case reports or clinical observations. Sharp (1951) summarized the treatment of 120 cases of Tinea tonsurans. Havyatt (1951) described the use of a 12 volt ultra-violet lamp for the diagnosis of ringworm infections of the scalp and also (1952) the treatment of *Microsporum canis* infections with dibromopropamidine isothionate. Emmerson (1951) published a survey of the incidence of tinea interdigitalis in a group of students at the University of Queensland. Mancy (1952) wrote a paper on 'Superficial Fungous Infection in Victoria'. Durie & Brown (1953) recorded a series of fungus infections in hospital practice. From a series of 533 patients 166 cultures of pathogenic fungi were obtained. (Table I). These authors also assessed the incidence of contaminants in their cultures. (Table II). Sharp (1955) wrote a paper on the management of ringworm of the scalp, and referred to a series of 120 cases of ringworm of the scalp caused by *Microsporum lanosum* occurring at the Royal Alexandra Hospital for Children, Sydney. This paper was presented at a meeting of the Australian Medical Congress, 1955. Durie (1955) gave a general account of tinea capitis and the fungi which cause it, compiled from the literature and from personal experience, and presented at a meeting of the Australian Medical Congress, 1955. Reference was made to 122 cultures of dermatophytes, isolated from patients at the Royal North Shore Hospital of Sydney which consisted of *Microsporum canis* (90), *M. audouini* (7), *M. gypseum* (11), *Trichophyton tonsurans* (8), *T. mentagrophytes* (1), *T. rubrum* (2), *T. violaceum* (1) and *T. sulphureum* (2). Hakendorf (1956) described an outbreak of *Trichophyton rubrum* infection in an institution caring for elderly people suffering from various chronic diseases. The outbreak involved 17 elderly men whose ages ranged from 65 to 87 years, one woman aged 70, two nurses and the sister-in-charge of the ward.

TABLE I

Types of Fungi	Areas Affected										
	Scalp.	Face.	Body.	Axilla.	Groin.	Arms.	Hands.	Legs.	Feet.	Nails.	Ear.	Total.
Epidermophyton floccosum	—	—	1	2	3	—	—	—	1	—	—	7
Microsporum lanosum (vel canis vel felis)	63	—	—	1	—	—	4	1	—	—	—	69
Microsporum audouini . .	6	—	1	—	—	—	—	—	—	—	—	7
Microsporum fulvum . . .	3	—	1	—	—	—	—	—	—	—	—	4
Trichophyton crateriforme	8	—	—	—	—	—	—	—	4	—	—	12
Trichophyton mentagrophytes (gypseum)	—	—	—	—	—		1	—	19	—	—	20
Trichophyton purpureum .	—	2	—	—	—	1	—	—	2	3	—	8
Trichophyton rubrum . .	—	—	1	—	—	1	—	—	1	—	—	3
Trichophyton sulphureum.	2	—	—	—	—	1	1	—	1	—	—	5
Sporotrichum schenkii . .	—	—	—	—	—	1	—	—	—	—	—	1
Hormodendrum pedrosoi .	—	—	—	—	—	1	—	—	—	—	—	1
Nocardia asteroides . . .	—	—	—	—	—	—	—	—	1	—	—	1
Candida albicans.	—	—	4	—	6	—	2	2	7	5	—	26
Candida parakrusei . . .	—	—	—	—	—	—	—	—	—	—	1	1
Candida tropicalis	—	—	—		—		—	—	—	1	—	1
Total												166

(From Fungous Infections in Hospital Practice. DURIE & BROWN (1953).

TABLE II

Name of Fungus	Number of Times Encountered as a Contaminant
Acremonium	1
Acrostalagmus	1
Alternaria	7
Aspergillus glaucus	1
Aspergillus niger	5
Aspergillus sulphurens	1
Chaetomium	3
Cunninghamella	1
Dematium pullularis	5
Fusarium	2
Gliocladium	2
Helminthosporium	6
Hormodendrum contaminant	7
Mucor	9
Nigrospora	1
Oospora	1
Paecilomyces	2
Penicillium	30
Rhizopus	1
Rhodotorula	12
Saccharomyces	6
Scopulariopsis	4
Ctenomyces	1
Streptomyces griseus	4
Trichoderma	4
Trichosporon	1
Trichothecium roseum	2
Ustilago	1
Verticillium	3

(From Fungous Infections in Hospital Practice, DURIE & BROWN (1953))

Dermatophytes from soil

DURIE & FREY[1]) (1955, 1956) described the isolation of keratinophilic fungi including *Microsporum gypseum* from the soil of New South Wales. Out of 96 soil samples from various parts of the State, *M. gypseum* was isolated from 12 and *K. ajelloi* from 15. The authors discussed the probable epidemiological significance of pathogenic fungi in the soil. In a later paper (1957) they described a new species of *Trichophyton* from New South Wales, isolated during the examination of a series of samples of soil from various parts of Australia and from New Guinea for the presence of keratinophilic fungi. This work is being continued and its scope enlarged.

---

[1]) Working with the help of a Grant from the National Health and Medical Research Council of Australia.

Dermatomycoses in animals

SEDDON (1953) discussed dermatomycoses in animals under the general heading of 'Favus'. However no instance of infection with *Achorion schoenleini* is mentioned. He states that 'wild mice have commonly been found affected with *T. quinckeam* during mouse plaques'. and that whitecomb in fowls caused by *Trichophyton gallinae* occurs in New South Wales and in Western Australia. 'Ringworm' he writes 'is not uncommon in domestic animals and is known to have occurred in cats, dogs, calves and horses'. The importance of the animal reservoir of infection in ringworm should be emphasized. A survey of animal ringworm, with precise cultural identification of pathogens such as has been carried out in England and elsewhere is needed in Australia.

Soil fungi: Fungous diseases of plants

Perusal of the "Review of Applied Mycology" for the years 1946—1956 shows a steady increase in Australian work on fungous diseases of plants and on the fungi of the soil. The Waite Agricultural Institute of South Australia reports that records are to be assembled for the eventual compilation of a fungus flora of Australia. MCLENNAN & DUCKER (1954) described the ecology of the soil fungi of an Australian heathland. THROWER (1954) discussed the rhizosphere effect shown by some Victorian heathland plants. ABERDEEN (1955) wrote on 'Quantitative Methods of Estimating the Distribution of Soil Fungi' and also (1956) 'Factors Influencing the Distribution of Fungi on Plant Roots'. The rusts of wheat and other plants have been studied by WATERHOUSE (1951, 1952, 1953); WATSON (1952); CASS SMITH et al. (1951); THOMAS (1951); SHAW (1953); WHITE (1954) and others. ANGELL (1949, 1951, 1955) has studied the brown rot of stone fruit and also (1950, 1951, 1952) seedling blight. LANGDON (1949, 1954) has written of Ergot (*Claviceps purpura*) in Queensland. WHITE & BAKER (1954) described host-pathogen relationships in powdery mildew of barley. Notes on plant diseases caused by fungi compiled by the Biological Branch of the New South Wales State Department of Agriculture appear regularly in the Agricultural Gazette of New South Wales, and similar work is done in other States of the Commonwealth. Most of the work in plant and soil mycology comes from the Commonwealth Scientific and Industrial Organization, from the State Departments of Agriculture situated in the various capital cities;

from the Faculties of Agriculture and Departments of Botany in the Universities of Sydney, Melbourne, Adelaide, Queensland, Western Australia and Tasmania; from the National University, Canberra; and from Institutes such as the Waite Agricultural Institute, South Australia and the Hawkesbury Agricultural College, New South Wales. This work is available in the collected papers of these various institutions and departments; in their annual reports and in the Gazettes of Government Departments and Journals of Agriculture in each State. In the 'Papua and New Guinea Agricultural Gazette' there may be found interesting accounts of fungus diseases of crops and fruit trees in a tropical environment (HARRIS, 1940). In the tropical and subtropical regions of Australia the protection of paper and other fabrics from attack by fungi is a serious problem. An account of preservatives for rot-proofing paper was published by DA COSTA and other (1956) and SPIELREN & BRADY (1954) discussed the comparative resistance to fungal attack of various fibres. WHITEHOUSE (1955) described the apparent mildewing of new book bindings. Marine fungi have interested some Queensland workers. CRIBB & HERBERT (1954) described 'Three Species of Fungi Parasitic on Marine Algae in Tasmania'; and CRIBB & CRIBB (1955, 1956) studied marine fungi from Queensland.

The above record is by no means complete, but it shows some of the many trends in applied mycology in Australia today.

The General Problem

Ubiquitous and very tenacious of life, the fungi are responsible for a formidable amount of disease in plants, in animals and to a less extent in man. Little is known of their ecology and of host-parasite relationships. Among plants, animals and human beings some individuals and some strains resist fungal attack better than others and the reasons for this resistance are by no means obvious. Perhaps the problem of the rust-resistant wheat is linked to that of the ringworm resistant skin or scalp or the tinea-free foot. GARRETT (1955) in an address on the microbial ecology of the soil, pointed out the necessity for the research worker to view his own field in its relation to other branches of biology. This is especially true of medical mycology, for the reservoirs of infection are to be found in animals and in the soil as well as in human beings. This has been shown in Great Britain and in the United States where surveys of animal mycoses have been made (AINSWORTH & AUSTWICK, 1955), LA TOUCHE (1955), MORTIMER (1955) and GEORG (1954).

Extensive studies of the occurrence of pathogens in the soil have been made in the United States, especially of histoplasmosis and the dermatophytes. The fungi like the poor are always with us; we cannot banish them from our environment nor indeed should we wish to do so, for the vast majority of them are harmless. Many are beneficial: pleasant as food, powerful in industrial processes or the source of valuable antibiotics. We have to live with the fungi, as with the bacteria, but both these invaders must be kept in their place.

The fundamental problem of all fungous disease whether of plants, animals or of man is the resistance of living tissue to invasion. In Australia, as elsewhere, there are two great problems for the mycologist today: the study of fungi in his environment, in their infinite variety; and the study of the factors governing the resistance of living tissues to fungal invasion.

Acknowledgements

My thanks are due to Mrs. M. F. Ridley of the Queensland Institute of Medical Research, to Dr. N. E. Goldsworthy of the Institute of Dental Research, Sydney, to the Chief Librarian of the Commonwealth Scientific and Industrial Organization, to Miss Joan Gardner of the Bacteriology Department, University of Melbourne, to Mrs. D. Frey of this Institute and to many others who have helped me to compile this survey.

References

Aberdeen, J. E. C. (1955). Quantitative methods for estimating the distribution of soil fungi: Pap. Dep. Bot. Univ. Queensland, **3**, (11): 83—96.

Aberdeen, J. E. C. (1956). Factors influencing the distribution of fungi on plant roots: Part I; Pap. Dep. Bot. Univ. Queensland **3**, (14): 113—124.

Ainsworth, G. C. & Austwick, P. K. C. (1955). A survey of animal mycoses in Britain: General aspects; Vet. Rec. **67**, 88. 1—10.

Alderson, L. W. (1949). Report on a case of cerebro-spinal meningitis due to Cryptococcus histolytica (Torula hominis); Med. J. Aust. **2**, 914—916.

Anderson, P. M. (1946). 'A laboratory study of Monilia albicans'. Med. J. Aust. **2**, 57—59.

Angell, H. R. (1949, 1950, 1951, 1955). Brown rot of stone fruits; J. Aust. Inst. Agric. Sci. **15**: 159; **16** (1), 33—40; **17** (4), 212—213; **21**, (3), 180—182.

Angell, H. R. (1950, 1951, 1952). Seedling blight; Aust. J. Agric. Res. **1** (1), 33—42, **2** (3), 286—94; **3** (2), 128—136.

Barrack, B. B. (1952) Chromoblastomycosis in Queensland; Aust. J. Derm., **1**, 207—213.

Barrack, B. B. & Powell, R. E. (1952). Sporotrichosis; Med. J. Aust., **1**, 624—626.

Barrack, B.B. (1957). Mycotic granulomata; Med. J. Aust., **1**, 189—192.

Barrack, B. B. (1957). Fungous infections in man exemplified by Tinea rubrum and Actinomycosis; Med. J. Aust., **1**, 273—275.

Buckle, G. & Curtis, D. R. (1955). Human Torulosis, therapy with Actidione and Contramine; Med. J. Aust., **2**, 854—859.

BURNS, R. H. G. & SIMMONS, G. C. (1952). A case of Actinomycotic infection in a horse; Aust. Vet. J. **28,** 34—35.

CASS SMITH, W. P., HARVEY, H. L. & GOSS, O. M. (1951)) Westralia — a new rust resistant pole bean; J. Dep. Agric. W. Aust. Series **2,** 28; **3,** 317.

CHRISTIE, R. & MORTON, MARY M. (1953). The detection of Candida albicans ;Aust. J. Derm. **22,** 87—93.

CONANT, N. F., SMITH, D. T., BAKER, R. D., CALLAWAY J. L. & MARTIN, D. S. (1944). Manual of clinical mycology. (1954) 2nd edition. Saunders, Philadelphia.

COX, L. B. & TOLHURST, S. C. (1946). Human torulosis, a clinical pathological and microbiological study, with a report of 13 cases. Melbourne Univ. Press, Carlton, N. 3., Victoria, Australia. pp. XI + 149. 67 figures. 15 plates.

CRIBB, A. B. & HERBERT, J. N. (1954). Three species of fungi parasitic on marine algae in Tasmania; Pap. Dep. Bot. Univ. Queensland, **3** (2); 9—13.

CRIBB, A. B. & CRIBB, JOAN W. (1955) Marine fungi from Queensland; Pap. Dep. Bot. Univ. Queensland **3** (10). 77—81.

CURTIS, A. J. (1951) A case of Torulosis in a domestic cat; Aust. J. Med. Tech., **1,** (3) 71—74.

DA COSTA, E. W. B., WATSON, A. J. & HINDSON, W. R. (1956). Preservatives for rot-proofing papers; Aust. J. Appl. Sci. **7** (1), 113.

DEMENTJEV, G. (1955) A case of nocardial mycetoma of the foot due to Nocardia madurae; Med. J. Aust. **2,** 824.

DOWE, J. B., GRAHAM, C. S., BROWN, S. & DURIE, E. B. (1953). A case of histoplasmosis; Med. J. Aust. **40** (i), 142—144.

DUHIG, J. V. & MEAD, M. (1951). Systemic mycosis due to Monilia albicans; Med. J. Aust. **1,** 179—182.

DURIE, E. B. (1954). Unpublished observation.

DURIE, E. B. & BROWN, S. (1953). Fungous infections in hospital practice; Med. J. Aust. **2,** 813—14.

DURIE, E. BEATRIX (1956). Mycotic infections of the scalp — mycology; Med. J. Aust. (i), 648—651.

DURIE, E. BEATRIX & FREY, DOROTHEA (1957). A new species of Trichophyton from New South Wales; Mycologia **49**, 3, 401—411.

DURIE, E. B. & FREY, D. (1955). Isolation of M. gypseum and of K. ajelloi from Australian soil; Nature, **176,** 4489. 936.

EMMERSON, B. T. (1951). A survey of the incidence of interdigital tinea in a group of students from the University of Queensland; Med. J. Aust. **2,** 837—842.

FAIRLEY, K. D. (1947). Actinomycosis of the paraaortic glands; Med. J. Aust., **1,** 799.

FINLAY, C. J. & GARVAN, J. (1949). Actinomycosis of or surrounding an ovary; Med. J. Aust., **1,** 845—847.

FORTUNE, C., FORMAN, G., COLEBATCH, J. & LUBBE, T. (1955). Torulosis; Med. J. Aust., **2,** 199—204.

FREY, D. M. & DURIE, E. B. (1956). The isolation of keratinophilic fungi, including Microsporum gypseum, from Australian soil; Aust. J. Exp. Biol. Med. Sci. **XXXIV,** 199—204.

GARRETT, S. D. (1955). Microbial ecology of the soil; Trans Brit. mycol. Soc. **38,** (i), 1—9.

GEANEY, B., HORSGALL, W. R. & NEILSON, G. (1956). Torulosis in Queensland: Report of 14 cases; Med. J. Aust., **2,** 378—382.

GEORG, L. K. (1954). The diagnosis of ringworm in animals; Vet. Med. **XLIX**, 4, 157—166.

GILMAN, J. C. (1950). A manual of soil fungi; Iowa State College Press. (Reprint of 1945).

GOLDSWORTHY, N. E. (1937). Pulmonary actinomycosis caused by an acid-fast species of Actinomyces; J. Path. Bact. **45,** 17—27.

GOLDSWORTHY, N. E. (1940). See SULLIVAN, H. R. Joint author.

GOLDSWORTHY, N. E. (1947). Actinomycosis with special reference to the cervico-facial type; Dent. J. Aust. **19,** 225—241.

GOLDSWORTHY, N. E. (1947). Personal communication.

HAKENDORF, A. J. (1956). An outbreak of Trichophyton rubrum infection in South Australia; Aust. J. Derm. **III,** 4. 208—209.

HARRIS, R. J. (1954). The propagation of citrus in the Keravat-area; Papua and New Guinea Agric. Gaz. **8,** (3). 7—17.

HARRIS, A. N. A. and HARDING, W. B. (1950). Unusual outbreak of mycotic dermatitis in lambs; Yearl. Insp. Stock, N.S.W. 85—37.

HART, L. (1947). Moniliasis in turkeys and fowls in New South Wales; Aust. Vet. J., **23,** 191—192.

HAVYATT, M. (1951). Use of a 12-volt ultra-violet bulb for the diagnosis of ringworm infections of the scalp; Med. J. Aust., **2,** 115—116.

HAVYATT, M. (1952). The treatment of Microsporum canis infections of the scalp with Dibromopropamidine Isethionate; Aust. J. Derm., **1,** (4). 239.

HENRY, J. N. (1952). Mycotic dermatitis or lumpy wool; Agric. Gaz., N.S.W., **63,** 108—110.

HICKS, E. D. (1946). Chromoblastomycosis: Report of a Case; Med. J. Aust., **2,** 705—706.

HILL, B. H. R., COOK, L. D., and SAXBY, C. (1953). Chromoblastomycosis (Dermatitis verrucosa): Report of a case; Aust. J. Derm. **II.** 2. 80—82.

HORSLEY, R. (1947). Paper read a meeting of the Section of Pathology and Bacteriology of the British Medical Association, N.S.W. Branch. (Unpublished).

INGLIS, J. A. and POWELL, R. E. (1953). Histoplasmosis: A review and report of a fatal Australian case; Med. J. Aust., **1,** 138—141.

JOHNSON, D. W. and DERRICK, E. H. (1948). Histoplasmosis: Report of an Australian Case; Med. J. Aust., **2,** 518—519.

KOVACS, Z. (1956). Personal communication.

LANGDON, R. F. N. (1949). Ergot of Poa annua L.; J. Aust. Inst. Agric. Sci., **15,** 39—41.

LANGDON, R. F. N. (1954). Ergot of Paspalum dilatum; J. Aust. Inst. Agric. Sci., **20**, 52—53.

LANGDON, R. F. N. (1954). The origin and differentiation of Claviceps species; Pap. Dep. Bot. Univ. Queensland, **3** (8): 61—68.

LANGERON, M. and VAN BREUSEGHAM, R. (1952). 'Précis de Mycologie'. Masson et Cie, Paris.

LA TOUCHE, C. J. (1955). The importance of the animal reservoir of infection in the epidemiology of animal-type ringworm in man. Vet. Rec. **67**, 36: 666.

LILIENTHAL, B. (1950) Studies of the flora of the mouth. III. Yeast-like organisms: some observations on their incidence in the mouth. Aust. J. exp. Biol. med. Sci. **28**, 279—286.

LILIENTHAL, B. (1955). The pathogenicity of Candida albicans isolated from the mouth. Oral Surg. Oral Med. Oral Path. **8**, 1214—1217.

LILIENTHAL, B. & GOLDSWORTHY, N. E. Studies of the flora of the mouth. I. Yeast-like organisms: some morphological and physiological characters. II. Yeast-like organisms: serological properties. Aust. J. Exp. Biol. Med. Sci., **28**, 261—269 and 271—277.

LILIENTHAL, B., HARRIS, R. & ARNOTT, A. J. (1956). Moniliasis: a report of 3 cases; Oral. Surg. Oral Med. Oral Path. **9**, No. 6, 632. **9**, 6, 632—637.

LOEWENTHAL, L. (1950). Actinomycosis; Med. J. Aust. **2**, 703.

LUDWIG, T. G. (1955). Actinomycosis originating in the maxillary region; Oral Surg. Oral Medicine, Oral Pathology, **8**, No. 8; 877.

LUDWIG, T. G. (1955). A study of some filamentous micro-organisms isolated from the human mouth; Dent. J. Aust., **59**, 6; 343.

MACMILLAN, H. (1955). Report on a case of localized blastomycosis; Aust. J. Derm. **III**, I; 38.

MCCONCHIE, I. (1951). Torula of lung: three cases treated by resection; Med. J. Aust. **2**, 685.

MCGEOCH, A. H. & MYERS, W. K. (1954). Report of two cases of chromoblastomycosis in New South Wales; Med. J. Aust., **2**, 218—219.

MCLENNAN, ETHEL & DUCKER, SOPHIE C. (1954). The ecology of the soil fungi of an Australian heathland; Aust. J. Botany, **2**, 2; 220.

MCTIER, G. A. W. (1948). Mycotic dermatitis in cattle in New South Wales; Yearbook Insp. Stock. N.S.W., 81.

MANCY, E. S. (1952). Superficial fungous infections in Victoria; Med. J. Aust. **1**, 883—884.

MEAD, K. W. (1955). Chromoblastomycosis at the age of eleven years; Med. J. Aust., **2**, 165.

MEAD, M. & RIDLEY, M. F. (1957). Sporotrichosis and chromoblastomycosis; Med. J. Aust. **1**, 192—197.

MINTY, C. C. J., MEAD M., & MCCAFFREY, M. F. (1956). Sporotrichosis: a case report from Queensland; Med. J. Aust., **1**, 704—705.

MORTIMER, P. H. (1955). Man, animals and ringworm; Vet. Rec. **67,** (36), 670.

MORTON, MARY M. (1953). A note on the detection of Candida albicans: Aust. J. Derm. **2,** 87.

MOULE, G. R. (1948). Lumpy wool of sheep; Queensland agric. J. **67,** 272—273.

MOULE, G. R. & SUTHERLAND, A. K. (1947). Mycotic dermatitis of cattle; Aust. Vet. J. **23,** 95—97.

MUNCH-PETERSEN, E. (1954). Actinomyces (Nocardia) sp. from a bovine udder infection; Aust. Vet. J., **30,** 297—300.

O'REILLY, M. J. J. & POWELL, R. E. (1953). Report of a case of Nocardial infection in Australia; Med. J. Aust. **40** (i); 703—705.

PEARSON, I. G. (1951). Moniliasis or thrush in poultry; Yearbook Insp. Stk. N.S.W.; 91.

POWELL, R. E. (1952). A survey of chromoblastomycosis in Queensland; Aust. J. Derm., **1,** 214—222.

ROBINSON, C. A. & ORBAN, T. D. (1951). A case of regional lymphatic sporotrichosis; Aust. J. Derm., **1,** (2): 142—144.

ROSE, T. (1948). Actinomycosis of the right cheek, Med. J. Aust., **2,** 700.

SAWERS, W. S. & THOMSON, E. F. (1935). Torulosis, with a report of a case of meningitis due to Torula histolytica; Med. J. Aust., **2,** 581.

SAXTON, W. J., HATCHER, F. & DERRICK, E. H. (1946). Chromoblastomycosis, with reports of two cases occurring in Queensland; Med. J. Aust., **1,** 695—696.

SEDDON, H. R., D. V. Sc. (Division of Veterinary Hygiene, Department of Health, Canberra, A. C. T., 1953). Diseases of domestic animals in Australia; Part 5, Volume I, Bacterial Diseases. Serv. Publ. Dep. Hlth. Aust. vet. Hyg. No. 10.

SHARP, H. (1951). Tinea tonsurans, a summary of the treatment of 120 cases; Aust. J. Derm. **1,** 2.: 138—141.

SHAW, D. E. & VALDER, P. G. (1953). A study of the microflora of wheat grass in New South Wales; Proc. Linn. Soc. N.S., **77,** 1953.

SPIELREN, R. E. & BRADY, C. J. (1954). A comparison of resistance to fungal attack of various fibres; Aust. J. app. Sci. **5,** (4): 418.

STEVENS, F. R. T. (1947). Chromoblastomycosis; Med. J. Aust. **1,** 93.

SULLIVAN, H. R. & GOLDSWORTHY, N. E. (1940). A comparative study of anaerobic strains of Actinomyces from clinically normal mouths and from actinomycotic lesions; J. Path. and Bact. **51,** 2: 253—261.

SUSMAN, M. P. (1954). Torula (cryptococcocus) infection of the lung; Aust. & N.Z. J. Surg. **23,** 4: 296.

THOMAS, I. (1951). New cereal varieties in Australia. (Wheat resistant to Puccinia graminis); J. Agric. West. Australia.

THROWER, L. B. (1954). The rhizosphere effect shown by some Victorial heathland plants; Aust. J. Bot. **2,** (2): 246.

TUCKER, R. & MILLAR, R. (1953). Outbreak of nocardiosis in the Brisbane Botanical Gardens; J. comp. Path., **63,** 143—146.

WATERHOUSE, W. L. (1951, 1952, 1953). Australian rust studies; Proc. Linn. Soc. N.S.W. **76,** 3—4: 57; **77,** 3: 209; **78,** 3: 147.

WATSON, I. A. & SING, D. (1952). The future for rust-resistant wheat in Australia; J. Aust. Inst. Agric. Sci.

WHITE, N. H. (1954). The growth of Erysiphe graminis hordei in susceptible and resistant varieties of barley; J. Aust. Inst. Agric. Sci. **20,** (2); 126.

WHITE, N. H. & BAKER, E. P. (1954). Host-pathogen relations in powdery mildew of barley. 1. Histology of tissue reactions; Phytopathology **44,** 11; 657.

WHITEHOUSE, J. A. (1955). Apparent mildewings of new book-bindings; Aust. J. Sci. **18,** (2): 60.

P. MARTENS
Directeur de l'Institut J. B. Carnoy
Louvain, Belgique

DONALD S. MARTIN
Medical Director
U.S. Public Health Service
Department of Health, Education and Welfare
Washington, D.C., U.S.A.

Gallery of Contemporary Noted Mycologists

14

R. BOSE

Department of Botany, R. G. Kar Medical College

Calcutta, India

Gallery of Contemporary Noted Mycologists

15

A. CATANEI
Institut Pasteur d'Algérie
Alger

Gallery of Contemporary Noted Mycologists

16

SELECTIVE, CHEMICAL EPILATION IN THE TREATMENT OF TINEA CAPITIS AS CONTRASTED WITH THE DIFFUSE X-RAY EPILATION.

TIBOR BENEDEK
(*Department of Dermatology, Stritch School of Medicine, Loyola University, Chicago, Ill.*)

(17. II. 1958)

Since my first report (1951) on the treatment of tinea capitis, based on entirely new principles, by the method of the selective, chemical epilation, the continued endemic character of the fungus infection of the scalp in Chicago and its vicinity did not change. The noticeable shifting at the infection from school age to pre-school age continued unabated throughout the last decade in this area.

The great number of cases of tinea capitis made it clear that the most efficient type of treatment of ringworm of the scalp caused by the anthropophilic *Microsporum audouini*, i. e. epilation by X-ray irradiation, could not be carried out for several reasons. For a mass treatment a sufficient number of X-ray equipment is not available and there is an absolute lack of trained personnel for its operation. Further difficulties in this method of treatment are represented by the objection of parents against the irradiation of the head, the unavoidable, subsequent baldness for weeks, and the almost impossible application of the method in children below three to four years of age.

The practical use of X-ray epilation, for the better or for the worse, recently suffered a most serious setback by the continued public discussion of the dangers and/or risks of radiation therapy. At the recent meeting of the American Association for the Advancement of Science (Indianapolis, 1957) biophysicist Dr. WILLIAM G. MYERS of Ohio State University College of Medicine declared that "There is a good deal of reason to question the advisability of using radiation therapy initially for non-malignant conditions such as tinea capitis", . . The guarded opinion of radiation experts, spread through the daily press, will only add to the ever growing reluctance of parents to give permission for X-ray epilation in tinea capitis of their children. Based on personal experience with parents I dare predict that the use of radiation energy in the treatment of tinea capitis will rapidly decline. In a few years it will probably be a matter of the past.

In order to cope with the ever spreading mass infection of ringworm of the scalp, it became necessary to turn to other types of remedies than X-ray epilation.

The U. S. Public Health Service, under the direction of L. Schwartz et al., in 1946, proved in its Hagerstown study, a prevailing consensus to the contrary, that local treatment of ringworm of the scalp in large masses is possible and that, to a certain degree, it is apparently efficient. During their study period, from August 1944 to November 1945, seventeen different medicaments, "fungicidal and fungistatic," were tried. Among these salicylanilid ointment gave the "best" results. This experiment opened up the flood gates for trials with newer "antifungal" compounds.

In vitro experiments preceded all these recommendations and silently it was assumed that the fungicidal and fungistatic compounds would exert an identical quotient of efficiency in clinical practice. These hopes, in no instance, were fulfilled. Clinical practice could not duplicate the in vitro results. The time needed for a "cure" was a minimum of from 6 to 12 weeks, the maximum, from 5 to 14 months. This fact naturally awakened at once the doubt as to whether the much praised antifungal remedies were the direct cause of a "cure".

Concerning the antifungal property of salicylanilid in vivo, I carried out investigations. In 40 consecutive cases of *M. audouini* infection of the scalp, undergoing treatment with salicylanilid, hairs were epilated under Woodlight every two weeks, for cultural control. Fifteen to eighteen hairs from different foci were distributed in three glucose agar slants. For periods up to 112 days these hairs infected with *M. audouini*, yielded normal colonies, without even the slightest retardation of growth, which at least was anticipated. Salicylanilid caused severe irritation in the form of suppurative folliculitis when applied after roentgen irradiation. This reaction, however, was seen peculiarly, only in areas of infected hairs.

In this group of cases there were three families, in two of which one sibling and, in the third, two siblings, were infected during the treatment of the first infected sibling with salicylanilid.

As described above with salicylanilid, similar cultural tests were carried out in a number of patients under treatment for tinea capitis caused by *M. audouini*, with copper-8-quinolinolate, copper undecylenate, 5% asterol dihydrochloride. The results were identical. However long the hairs were treated — from a few days to several weeks — with these preparations, the post-application cultural tests were always the same: prompt growth of the fungus from the treated hairs without any retardation, with absolutely normal colonies like the controls.

The antifungal drugs have usually been incorporated in an ointment base, sometimes used in liquid form. While ointments are always cumbersome when applied to the scalp, both forms of medication often interfered with the use of the Woodlight by blacking out the fluorescence. This factor made one of the absolute means of diagnosis, control of progress and cure illusory.

Whatever type of remedy to be used for the treatment of ringworm of the scalp at home, two requirements must be fulfilled: (1) the method of treatment has to be as simple as an ordinary hairwash to be understood and carried out at home; (2) it has to work with sufficient rapidity in order to eradicate the infection before the mothers of these children become tired of the prosedure, and before further contact infection could be caused.

None of the suggestions up-to-date have fulfilled these elementary requirements.

In all these antifungal remedies one basic factor of failure was generally recognized to exist. It was, that these compounds both in ointment and/or in liquid form, do not penetrate the hair follicles, thus, they do not attack the very source of continuous recrudescence of infection.

In all these previous attempts which should lead to an efficient local treatment of tinea capitis, there was one basic idea — almost an uncontrolled obsession — *to kill the fungi.* This idea could prevail only with the complete disregard of the anatomical structure of the hair, on one hand, and the distribution of the fungi in the hair shaft, hair root and in the hair follicle, on the other.

Non-medical mycologists apparently never paid proper attention to the peculiar avenue of approach of fungi causing tinea capitis and their relation to the surface of the scalp and to the depth of the hair follicle. Mycologists working in the laboratories of pharmaceutical houses are given the task to look for fungistatic and fungicidal chemicals, testing thousands of them. Those which have the most conspicuous effect are put on the market with the definitely misguiding, often irresponsible statement that they offer a "fungistatic and/or fungicidal" preparation for the treatment of tinea capitis. One look at Figure 1 will show mycologists why their often highly praised "fungistatic and fungicidal" preparation is an absolute failure in their clinical application. Upon the stratum corneum of the epidemis of the scalp the fungus spread only in mycelial form. Whenever they reach the opening of a hair follicle they may dip down along the hair shaft, infecting the hair shaft within or without as the case may be (whether the fungus is an endothrix or ektothrix species). In the depth of the hair follicle the fungi are safe, because hidden and protected, from the effect of the currently marketed "fungistatic and fungicidal" chemicals. Ointments block the opening of the hair follicles and thus, they seal off the true source of further infection. They never reach the fungi luxuriantly vegetating in the hair follicle. The cultural experiments carried out by me during the application of the preparation mentioned above, clearly prove this point. Mycologists, being unfamiliar with the anatomical structure of the tissues invaded by fungi of tinea capitis, have to give up the idea

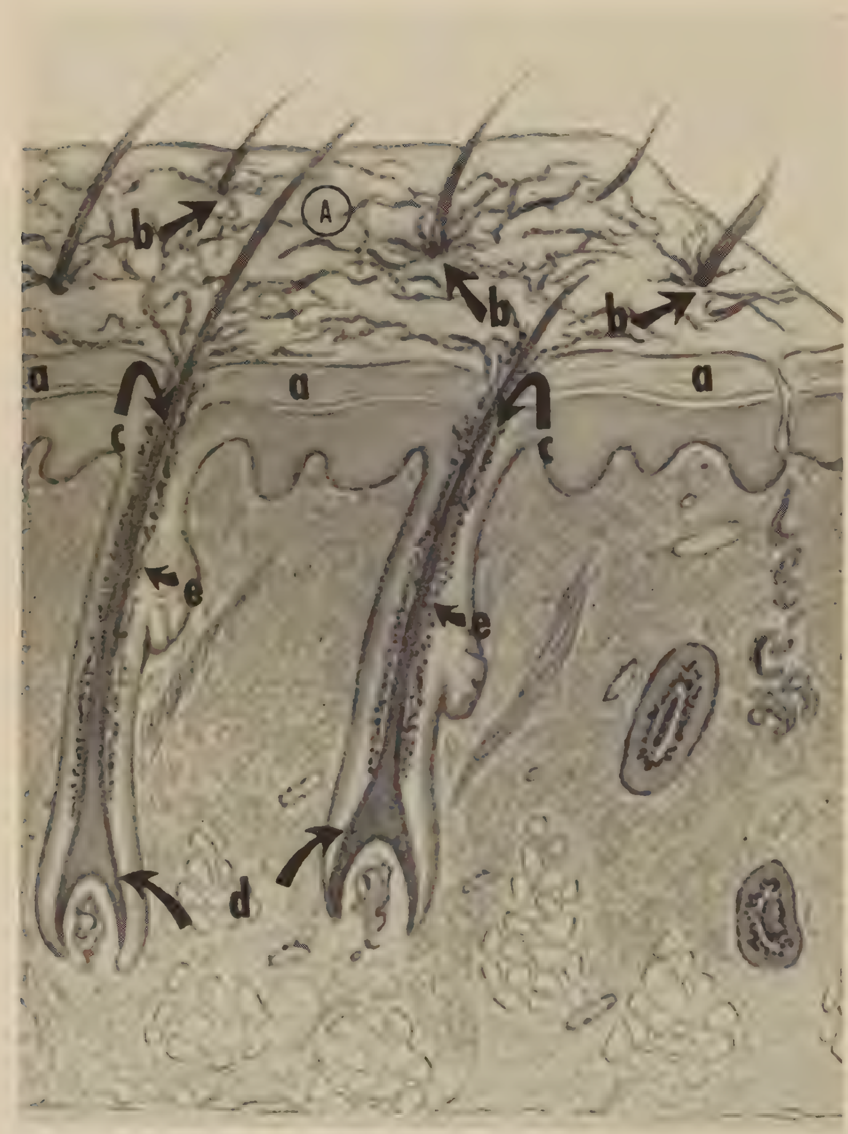


Figure 1. Diagrammatic sketch of the epidermis of the scalp. (A) Mycelia of the fungus (*M. audouini*) spreading upon the surface of the str. corneum. (a) Str. corneum of the epidermis in vertical section. (b) Mycelia of the fungus bypassing the orificium of the hair follicle. (c) Mycelia of the fungus is dipping down into the hair follicle, forming a spore sheath (e) along the hair shaft. (d) Site of separation of the hair shaft from the papilla pili under the impact of the Compound for selective, chemical epilation.

that fungi can be killed upon or in the human tissue, here, in tinea capitis.

This diagrammatic sketch of the section of the scalp is based on a similar sketch published by White Laboratories, Inc., 1953, and used here by their kind permission. The fungi in their spread on the str. corneum of the epidermis of the scalp and their invasion into the hair follicles are added from original preparations of the author. The whole artwork is from the pen of Miss VICTORIA CATALANI whom the author is deeply indebted to for her great understanding and sincere endeavor.

The great disappointment experienced with the highly recommended "antifungal" compounds mentioned above, spurred the writer to look for an entirely different solution of the problem of local treatment of tinea capitis.

It has become clear to me for á long time, that we cannot kill fungi in vivo without complete destruction of the invaded epidermis and hair follicle apparatus, and, thus, *I completely gave up the idea of killing the fungi.*

I endeavored to imitate the X-ray epilation of the infected scalp by chemical means in the simplest procedure. The method turned out to be far superior to X-ray epilation in several fundamental respects.

The New Method of Selective Chemical Epilation of the Scalp in Tinea Capitis

(*a*) *The Origin of the Idea of Chemical Epilation*

Ever since I entered the field of medical mycology, I rejected the use of potassium hydroxide for the mounting and clarification of fungus infected scales and hairs, using instead, chlorallactophenol, which is far superior to KOH in every respect. Almost a decade ago, the writer pointed out the many reasons for this superiority. Being familiar with the working mechanism (particularly the penetrating power) of this mounting fluid in vitro, the idea occurred to me to transfer these excellent advantages from the laboratory to clinical practice. The chemical formula of the mounting fluid needed only some modification in order to be applied to the scalp.

My plan was to work out a method which (1) is absolutely selective, attacking only the infected hairs; (2) is clean and does not prevent the use of the Woodlight; (3) is simple in its application; (4) leads to a definite cure in the shortest possible time and (5) is harmless, causing no local irritation and/or systematic involvement.

The final compound, tested in my Service as well as in private practice now over a period of eight years, completely fulfilled the above requirements.

Here is the Formula.[1])

Copper Sulfate	5%
Chloral hydrate	5%
Glycerin	78%
Sodium lauryl sulfate	1%
Aq. dest.	11%

None of the ingredients of the Compound are toxic; they are neither primary irritants nor sensitizing agents. Despite deep penetration into the hair follicle apparatus, there is no systemic absorption demonstrable by urine analysis or clinical reaction, such as headache, nausea, or any type of skin symptoms.

(b) In Vitro Experiments with the Compound

My own tedious and time-consuming in vitro experiments with the Compound and with its single ingredients clearly prove that there is no correlation whatsoever between the results of the in vitro experiments and the efficacy of this preparation in its clinical application. Therefore, I present herewith only a condensed summary of my in vitro findings with this Compound, and, with its single ingredients.

The experiments have been carried out with eight strains of *Microsporum,* six anthropophilic, two zoophilic. All were freshly isolated.

In DIFCO-beef broth containing (a) 1% glycerine, (b) 1% chloral hydrate, respectively, no strains grew within an observation time of 14 days, at room temperature. The controls, in straight beef broth, showed luxuriant submerged and surface growth.

Cupric sulfate, 1%, added to beef broth definitely retarded the growth of the above fungi so that after one week there was no growth; after two weeks, there was a growth one to two plus, with reference to the controls.

The Compound as a whole, used in the same manner, 1% being added to beef broth, prohibited the fungus growth within a time of observation of 14 days. This result is ascribed to the effect due to chloral hydrate. Despite the fact that the in vitro tests showed some fungicidal and some fungistatic effect of the Compound the practical, clinical application of this preparation has nothing to do with its possible antifungal properties.

During the whole treatment with this Compound, tested in all cases, hairs gave a perfectly normal culture in form and structure without any retardation of germination, compared with the respective controls, hairs epilated before the treatment.

The efficacy of the Compound is based solely on its selective, chemical, epilatory power on fungus (*Microsporum*) infected hairs [2]) due to its complete and deep penetration of the hair follicle, hair shaft and, hair root.

---

[1]) In the further discussion this Formula will be referred to as the "Compound".

My first communication was based on the treatment of 73 white, (boys 61, girls 12) and of 23 colored (boys 14, girls 9) children. Except for the age 13, all the ages, from 1 to 15 years, were represented. The ratio between boys and girls was 3.6 : 1. The causative fungus was culturally determined in every case. In 90 cases, i.e., 93.8%, *M. audouini* was found, and in 6 cases, i.e. 6.2 %, *M. lanosum*. Since then, 153 subsequent patients have been treated for tinea capitis through the years. The ratio between the sexes, the species of the causative organisms remained approximately the same.

Concerning the duration of the infection on admission of the patients, there was a huge difference and, of course, inaccuracy in the report of the parents. However, the lowest limit was from three to five months. Many indicated at least one year's duration and at least eight children had the infection up to three years, in which cases the involvement of the whole scalp or the greater part of it made the parents' statements plausible.

My method of the selective chemical epilation underwent in the meantime a crucial test on an independent, huge material. Its story is interesting. LIFE magazine, in its issue of November 13, 1950 brought a graphic report about a great ringworm (tinea capitis) epidemic in the Canadian city of Sault St. Marie, Ontario. Since all attempt to stop and eradicate this huge epidemic which involved about 820 odd cases, with the marketed "fungistatic and fungicidal" drugs according to the pictorial report, I offered my help to the City Health Officer in charge, Doctor J. E. GIMBY. He gladly accepted my help to try out my new method. He informed me (February 23, 1951) that "we have had ample opportunity to try out many so called cures and nostrums. I have in my office 22 unopened cartons of remedies which were sent me from all over Canada and United States . . . *Your solution was the only one which does as you claim* . . ." (Italics mine).

Doctor GIMBY kindly sent me a copy of the progress report on the treatment of tinea capitis with my method, forwarded as official report to the Department of Health at Toronto. Here is the report.

---

[2]) I had no opportunity to test this Compound in any other than *Microsporum* infections of the scalp. However, since in *Trichophyton*, or *Achorion* infections the same principles hold true, i.e., the selective, mechanical removal of infected hairs, without any killing of fungi, exactly the same useful therapeutical effect can be expected in the other tineas.

TABLE 1 *Progress report on the treatment of* 849 *cases of tinea capitis by the method of the selective chemical epilation at Sault St. Marie, Ontario, Canada.*

RINGWORM SCORE		MAY 16 & MAY 23 1951		
MAY 16				
ZONES	NEGATIVE	IMPROVING	NO CHANGE	TOTAL
I	135	67	21	
II	130	54	10	
III	118	82	18	
IV	142	40	32	
	525	243	81	849
Percentage Negative 62				
MAY 23				
I	141	58	21	
II	130	55	9	
III	134	56	14	
IV	146	34	34	
	551	203	78	833

Percentage Negative 66.66

Difference in Totals, due to absentees week of May 16—23.

	CERTIFIED NEGATIVE for 6 consec. weeks.	NEGATIVE & UNDER OBSERVATION 6 weeks not up	NEGATIVE AFTER EPILATION	TOTAL
ZONES				
I	75	34	32	
II	74	40	16	
III	78	24	32	
IV	77	23	16	
	304	121	126	551

This report is self-explanatory. It shows that from a total of 849 cases within six weeks 551 were negative, among them 304 cases which remained negative after an observation for six consecutive weeks. These results speak for themselves.

(c) The Clinical Application of the Compound.

The Compound is absolutely harmless. It does not cause any change (contact dermatitis, irritation, sensitization) on the normal, noninfected scalp. It does not attack noninfected hairs. However, it may impregnate the openings of infected hair follicles so that under treatment infected areas of the scalp may get tinted with coppercolor. This discoloration, however, does not interfere with or extinguish the fluorescence by Woodlight. It can safely be used for control of the therapeutic progress and final cure. The sharp demarcation of infected areas under treatment is a great advantage because, in at-home-treatment they are clearly visible without the help of Woodlight.

In some cases, there is some redness and elevation of the infected areas which stand out sharply circumscribed in their normal surrounding. There is no burning or, itching sensation following the application of the Compound. In a few instances, slight folliculitis was observed in the infected areas and in these alone. The redness of the patches, the slight inflammation, the light folliculitis are, however, mainly, if not entirely caused mechanically by hard brushing of the scalp. This type of irritation spontaneously and quickly subsides after the brushing is discontinued.

The Compound has complete penetration of the whole depth of the hair follicle as well as the aerial (shaft) and root portions of the hair from within. In other words, the penetrating fluid reaches the very last branching of mycelia down into the "neck" of the hair bulb.

The Compound attacks selectively only the fungus infected hairs. After five to six applications of this Compound — 2 to 3 days — the infected hair is completely loosened and can be lifted out from the hair follicle without pulling. There is not the slightest resistance and, the hair is lifted out in toto, together with the root portion. This holds true for the living "bulb hair" (in German: Papillenhaar; in French: cheveux à bulbe creux) as well as the dead "club hair" (in German: Kolbenhaar; in French: cheveux à bulbe plein.) The adhesive tape test shows results in from three to five days that one used to see only in the fourth week following X-ray epilation.

The total duration of treatment if correctly and conscientiously carried out, is generally from two to four weeks. There was no difference in time necessary to cause a selective epilation in infected areas, whether it was penny size or covered on three -quarters of the scalp, since all of the infected hairs become loosened at almost the same time. The falling hair is not the result of successive physiological replacement of infected hairs by normal healthy ones, but, is due to a simultaneous loosening of all infected hairs.

In the whole series there was not a single instance in which the torpid (noninflammatory) type of *Microsporum* infection would have turned follicular-suppurative under the treatment or a kerion would have developed.

In the procedure, the loosened (infected) hairs can simply be brushed out of the scalp. In instances where fluorescent hairs in treated areas remain after shampooing, they can be most easily epilated by hand by a slight touch, without any pain.

After the selective chemical epilation within the ordinary physiological time limit, the normal, healthy hairs will replace the epilated infected hairs. There is no danger or even the slightest probability of a permanent alopecia.

The old tenet concerning the difference in the treatment in tinea capitis, depending upon the kind of infecting fungus, whether anthropophilic or zoophilic, does not hold true any longer, as pointed out by the present author, in 1943. Here again, I can fully confirm this observation. *M. audouini* may cause follicular-suppurative inflammation and/or kerion, while *M. lanosum* may lead only to a torpid, noninflammatory tissue reaction.

However, it should be clearly understood that this method of chemical, selective epilation — and by the same token, any other local treatment carried out at home — however simple and efficient it may be, has an absolute drawback compared with X-ray epilation. In the latter, one needs one single operation (Kienboeck-Adamson five points irradiation) and one is absolutely independent from the whims of the home. The radiation injury to the hair bulbs (to all the hair bulbs, normal as well as infected) is done at one time and there is no further fussing with haircutting or, with any other procedures; the whole process runs its own definite course.

Thus, any method, including the one presented here, is no exception. In local home-treatment one is at the absolute mercy of the person in charge. In that sence, one can only state how this method is working if under guidance by exact and conscientious hands.

Following the disappearance of the last fluorescent hairs, the infected child remained under observation six more weeks. During this period the scalp was checked by Woodlight inspection every two weeks. After the third negative inspection, the child was discharged as cured.

Instructions For The Parents

A. Boys

1. Clip [1]) the hairs on the entire scalp before treatment begins and every week thereafter. Hand clippers or scissors should be properly cleaned, and, sterilized after

---

[1]) Clipping the hairs is sufficient and more advantageous than shaving, because, at time of shampooing and brushing, there is a natural stubble to grasp with a brush. Moreover, the idea of shaving the scalp is directly horrifying to many mothers.

use. Clipped hairs should be carefully collected and burned to prevent further spread of infection.

2. Apply the solution to the infected area(s) or to the whole scalp as the case may be. A few drops of the Compound are poured on the infected area(s) repeatedly and rubbed in with a soft tooth brush for 2 to 3 minutes, twice daily, morning and evenings.

3. Boys must constantly wear a stocking cap, day and night: (a) to keep the solution on the scalp; (b) to prevent the spread of infection. Scullcaps should be changed at each shampooing. The used ones should be boiled for 10 minutes and washed, then, they are suitable for use again.

4. After every third rub the whole scalp will be shampooed with either a shampoo or any good soap and the infected areas rubbed off for 2 to 3 minutes with a soft hand brush, 3" × 1" in size, to better enable removal of loose hairs.

5. Following the shampooing, the scalp should be dried completely and the Compound rubbed in again.

6. This simple cycle should be repeated until the doctor advises that the treatment be discountinued.

7. Only the doctor can tell that the ringworm disease is cured.

B. Girls

The procedure, with one exception, is exactly the same as for boys. However, in the case of girls, total clipping of the scalp can be dispensed with. It is, however, reasonable and expedites the whole treatment, if and when single larger patches are clipped every week and, of course, before the treatment begins. The rest of the hair covers up these clipped areas. If the infected areas are larger or they are exposed at the temples, for instance, the girls should also wear stocking caps.

Both boys and girls should never use each others' comb or brush and the infected child should sleep separately in his or her own bed, if possible.

These simple instructions are handed out to the parents in each case. Besides, the whole procedure is thoroughly explained by the doctor and, in every instance, the method is demonstrated as to how the Compound shall be applied and rubbed in.

Discussion

It is a curious fact that authors, using local medication for the treatment of tinea capitis, failed to lend their interest to two important factors: (1) how long the infected hairs, under local treatment, retain the viability of the infecting fungus; in other words, how long these infected hairs, in the course of treatment, will give a positive culture; (2) which kind of hairs they are, bulb-hairs or club-hairs, which are epilated in the course of treatment.

I already mentioned the fact that tinea microsporina treated with salicylanilid and other "fungicides" gave continuously positive cultures, while under treatment. The cultures of *Microsporum* obtained in these experiments did not show any difference in their time of germination, progressive growth and cultural characteristic of the colonies, compared with the controls grown from infected but untreated hairs.

My experiments clearly revealed that these "fungicidal" and "fungistatic" preparations have no such effect whatsoever in vivo.

During these very same experiments, a sample of 8 to 12 hairs taken at random from the infected areas, revealed that the easily epilated hairs were dead hairs, "club-hairs." "Bulb-hairs" were not found in these samples, because living hairs are so firmly anchored in the follicle that the infected hairs simply broke off at the follicle opening, leaving the infected root portion of the hair in the follicle.

In a similar experiment with the Compound under selective chemical epilation, both infected "bulb-hairs" (living) and "club-hairs" (dead) were present in the samples.

These observations may lead only to one conclusion: that none of the different and highly advertised fungicidal and fungistatic preparations caused a cure of tinea capitis, but the infected hairs were slowly and in succession, eliminated in a natural way, in the course of the natural change of hairs (Haarwechsel.).

These facts, therefore, make it understandable, that, relatively small patches of tinea capitis could be "cured" more quickly than those cases in which a quarter or more of the scalp was involved.

Since the hairs in the course of the natural change are replaced in succession, i.e., the change-over from living "bulb-hairs" to dead ,,club-hairs"takes place irregularly here and there, it is clear that this change-over is consummated more rapidly in smaller areas than in larger ones. This conclusion is supported by the figures of Felsher and his analysis concerning the direct relationship between the number and size of the lesions and the time required to effect a "cure."

In 1943, this author thoroughly discussed the public health aspect of tinea capitis. He has nothing to add to the statements made at that time. No progress and no improvement have occurred since that time in this important public health problem. The health legislation is not uniform throughout the states. In the present specific case, in Illinois, favus only is notifiable among the tineas of the scalp. In Indiana, in addition to favus, "ringworm of the scalp" is notifiable. The health laws governing fungus infections of the scalp have "no teeth" at all. Thus, endemic foci of infection are often established with the possibility of their eruption in epidemic proportion at any time.

Summary

After almost a decade of practical experience with the selective, chemical epilation as a most advanced method in the treatment of tinea capitis, a progress report is presented. The author's additional material covered 153 more cases of tinea microsporina, while Doctor Gimby's material encompassed 849 cases during an epidemic of tinea microsporina at Sault St. Marie, Ontario, Canada.

The formula of the Compound for selective, chemical epilation is given in the body of the paper. Despite the fact that the in vitro tests with its single ingredients (Copper sulfate, Chloral hydrate) revealed some fungistatic properties, the practical, clinical application of this preparation has nothing to do with its possible antifungal effect.

The efficiency of the Compound is based solely upon its selective, chemical, epilatory power on fungus infected hairs only. The Compound completely penetrates the hair follicle in its whole depth and saturates the aerial and root portions of the hair from within. The infected hairs — and only the infected ones — are separated from the papila pili so that they can be simply brushed out from the scalp. The fungi are not killed by this method, because they cannot be killed in human tissues by any method.

The Compound is neither an irritant, nor a sensitizer; it has no systemic effect. The total duration of the treatment with the Compound, if correctly and conscientiously carried out, is from two to four weeks.

Simple instructions for the guardians are presented for the purpose to properly carry out the home-treatment.

Zusammenfassung

Nach der praktischen Erfahrung von beinahe einem Jahrzehnt mit der selektiven, chemischen Epilation, als die meist entwickelte Methode in der Behandlung der mykotischen Infektion der behaarten Kopfhaut, wird dieser Fortschrittsbericht erstattet. Des Autors Krankengut umfasste 153 zusätzliche Fälle von Tinea microsporina, während auf 849 Fälle sich Doktor GIMBY's Krankengut während einer Epidemie dieser Krankheit in Sault St. Marie, Ontario, Canada erstreckte.

Die Formel des Mittels für die selektive, chemische Epilation ist in der Arbeit gegeben. Wie wohl die in vitro Tests mit den einzelnen Bestandteilen des Mittels (Kupfersulfat, Chloralhydrat) etwas fungistatische Wirkung gezeigt hatten, hat die praktische, klinische Anwendung dieses Mittels mit der möglichen, antifungalen Wirkung nichts zu tun.

Die Wirksamkeit des Mittels beruht allein auf seiner selektiven, chemischen Eingenschaft, lediglich die Pilz-infizierten Haare von der Kopfhaut zu entfernen. Das selektive Mittel dringt in den Haarfollikelapparat in seine ganze Tiefe ein und durchtränkt den Haarschaft und die Haarwurzel in ihrer ganzen Dicke. Die infizierten Haare, — und nur die infizierten, — werden von der Papilla pili getrennt, so dass sie von der Kopfhaut einfach herausgebürstet werden können. Die Pilze werden dabei nicht getötet, weil man sie mit keiner Methode in dem menschlichen Gewebe töten kann.

Weder reizt das selektive Mittel das Gewebe, noch macht es empfindlich. Es hat keine Systemwirkung. Die Dauer der Behandlung mit dem selektiven Mittel, wenn es genau und gewissenhaft angewendet wird, ist zwei bis vier Wochen.

Eine einfache Anweisung für die Eltern für die genaue Ausführung der Behandlung ist gegeben.

References

Benedek, T.: Selective, chemical epilation in the treatment of tinea capitis as contrasted with the diffuse X-Ray epilation. Urol. & Cutan. Rev. **55** (9): 539—550, 1951. (29 references; papers not quoted here separately can be found in this paper)

Benedek, T. & Felsher, I. M.: Epidemiology of Tinea capitis. I. A study of tinea capitis in a dispensary. Arch. Dermat. & Syph. **49**: 120—123, 1944.

Benedek, T.: Contribution to the epidemiology of Tinea capitis. II Tinea capitis as a public health problem in family and school. Urol. & Cutan Rev. **47** (7): 416—432, 1943.

Benedek, T.: Contribution to the Epidemiology of Tinea capitis. III. Some diagnostic problems in Tinea capitis. Mycologia **36** (6): 598—626, 1944.

Myers, W. G.: in Panel Discussion on "Social Aspects of Science as Illustrated by the Radiation Problem" at the meeting of the American Association for Advancement of Science, December 29, 1957, Indianapolis. — Medical News, **4** (1): January 13, 1958.

PHYSIOLOGIE DES ACTINOMYCETES AEROBIES PATHOGENES

Recherches sur l'activité protéolytique et sur la nutrition azotée et carbonée de *Nocardia asteroides, N. brasiliensis, Streptomyces madurae, S. pelletieri* et *S. somaliensis*

par

F. Mariat
(*Service de Mycologie et de Physiologie Végétale,
Institut Pasteur, Paris*)

(17.XII.1957)

Introduction

Les actinomycètes aérobies qui sont maintenant unanimement classés dans les schizomycètes (ordre des actinomycétales) sont des microorganismes dont les caractères sont extrêmement variables. Leur morphologie macroscopique (forme, couleur, consistance, aspect des colonies en culture) est tout particulièrement sujette à d'importantes variations. Ces variations sont dûes, le plus souvent, à des modifications des conditions de milieu ou encore à l'apparition de variants ou de mutants. Cette morphologie macroscopique, tellement fluctuante, est le plus important caractère utilisé pour la détermination spécifique des actinomycètes. L'espèce, chez les actinomycètes, est de ce fait, souvent difficile à préciser (Waksman, 1957). Il semble donc souhaitable que, parallèlement aux caractères morphologiques observés sur des milieux constants et reproductibles (donc si possible chimiquement définis), on utilise pour la détermination de l'espèce, des caractères physiologiques stables et constants. La recherche de ces propriétés physiologiques „spécifiques", a été entreprise par divers auteurs parmi lesquels il faut tout spécialement citer Waksman (1918, 1919, 1920) qui publia en cette matière des mémoires qui font toujours autorité.

La grande importance économique qu'ont pris certains actinomycètes, a fait que la physiologie de ces germes utilisés industriellement a été particulièrement bien étudiée (Perlman, 1953).

Chez les actinomycètes producteurs d'antibiotiques, les travaux de Pridham & Gottlieb (1948) puis ceux de Ohki (1953), Benedict et al (1955) Perlman & O'Brien (1956), etc. . . . ont montré que l'utilisation de composés carbonés pouvait être employée comme caractère taxonomique. Les actinomycètes pathogènes pour l'homme et l'animal n'ont, en revanche, été que peu étudiés de ce point de vue. Ils ont cependant une relative importance en pathologie: ils provoquent des maladies telles que les mycétomes actinomycosiques et les nocardioses dont MARIAT (1957) rappelle les principaux caractères. WAKSMAN (1918, 1919, 1920) étudie la physiologie des principaux actinomycètes aérobies pathogènes mais son étude était limitée à une seule ,,souche'' de chaque espèce. MAC CLUNG (1954), utilisant un milieu synthétique de base, a étudié la nutrition carbonée de six souches de l'espèce *Nocardia asteroides* qui a été la plus étudiée de ce point de vue. MACKINNON & ARTAGAVEYTIA-ALLENDE (1956) rendent compte des propriétés physiologiques de plusieurs isolements de chacune des principales espèces responsables de mycétomes. Dans une note antérieure, MARIAT (1954) donne des résultats préliminaires se rapportant à la physiologie de diverses espèces données comme pathogènes. Il entreprend ensuite, de réunir un nombre suffisant d'isolements de chacune des principales espèces pathogènes et étudie certains de leurs caractères physiologiques. Il rend compte succinctement de l'utilisation de divers composés carbonés et azotés par ces microorganismes (MARIAT & LAVALLE, 1955; MARIAT 1957).

Dans le présent mémoire nous rendons compte des propriétés physiologiques des différentes ,,souches'' étudiées. Ces ,,souches'' (le mot souche désigne ici un isolement particulier) appartiennent aux principales espèces aérobies pathogènes *Nocardia asteroides, N. brasiliensis, Streptomyces* (*Nocardia*) *madurae, S.* (*N.*) *pelletieri* et *S.* (*N.*) *somaliensis.*

Nous envisageons le pouvoir protéolytique, la nutrition azotée et la nutrition carbonée de chacune des souches. Nous donnons également les principaux caractères morphologiques observés sur les différents milieux usuels.

Matériel et Méthodes

I. Organismes utilisés.

La plupart des ,,souches'' étudiées ci-dessous, sont isolées de mycétomes actinomycosiques, c'est-à-dire de maladies chroniques, sous-cutanées, provoquées par l'introduction traumatique des germes responsables dans le derme. Les actinomycètes de l'espèce *Nocardia asteroides,* bien que décrits comme agents de mycétome, sont plus fréquemment rencontrés dans des infections viscérales, localisées aux poumons ou au système nerveux central.

Les espèces pathogènes appartiennent à deux genres de l'ordre des actinomycétales, le genre *Nocardia* (*N. asteroides* et *N. brasiliensis*) et le genre *Streptomyces* (*S. madurae, S. pelletieri* et *S. somaliensis*).

Nocardia asteroides. Nous avons étudié douze ,,souches'' de cette espèce. Elles proviennent soit de collections, soit d'isolements récents. Une des souches présente des caractères morphologiques faisant penser qu'elle est étrangère à l'espèce étudiée (n⁰ 349). Les numéros des souches sont ceux de la mycothèque du Service de Mycologie et de Physiologie Végétale de l'Institut Pasteur.

Souches n° 318: Laboratorio Crittogamico Italiano, Pavia
85: Institut Pasteur
302: London School of Hygiene and Tropical Medicine (LSHTM)
328: Dr Duche, Paris
336: Institut Pasteur (Brion et al. 1955)
333: Institut Pasteur
322: Dr Celli, Italie
358: Institut d'Hygiène de Montevidéo
360: Institut Bactériologique Malbran
320: Institut Pasteur (Testard et al. 1954)
349: X . . . morphologiquement différente
369: Institut Pasteur

Nocardia brasiliensis. Douze souches ont été étudiées au total, mais les essais ont surtout porté sur dix d'entre elles. Les caractères morphologiques de deux souches les éloignent de l'espèce type (n° 342 et 343).

Souches n° 352: Institut d'Hygiène de Montevidéo
357: Dr P. Lavalle, Mexico
347: Institut Oswaldo Cruz
344: ,, ,, ,,
348: ,, ,, ,,
346: ,, ,, ,,
345: ,, ,, ,,
351: Institut d'Hygiène de Montevidéo
342: X . . . morphologiquement différente
343: X . . . morphologiquement différente
370: Dr Vanbreuseghem, Anvers (Vanbreuseghem et al, 1956)
371: Dr Vanbreuseghem, Anvers

Streptomyces madurae. Quinze souches de cette espèce ont été étudiées. Plusieurs d'entre elles sont d'isolement récent. Deux des souches ont des caractères différents de ceux de l'espèce type qui est assez bien définie (n° 356 et 359).

Souches n° 83: Institut Pasteur
306: L.S.H.T.M.
307: ,,
332: Institut Pasteur
334: ,, ,,
338: Institut Oswaldo Cruz
339: ,, ,, ,,
340: ,, ,, ,,
341: ,, ,, ,,
356: X . . . morphologiquement différente
359: X . . . morphologiquement différente
353: Institut d'Hygiène de Montevidéo
363: Institut Pasteur
364: ,, ,,
366: ,, ,,

Streptomyces pelletieri. Huit souches ont été étudiées. L'une d'entre elles est tout à fait différente de l'espèce type qui est également bien définie (n° 310).

Souches n° 89: Institut Pasteur
309: L.S.H.T.M.
308: ,,
310: X . . . morphologiquement différente
354: Institut d'Hygiène de Montevidéo
84: Dr Duche, Paris
326: ,, ,,
362: Institut d'Hygiène de Montevidéo
372: Dr Baylet, Dakar
374: ,, ,,

Streptomyces somaliensis. Nous n'avons malheureusement pû réunir que trois souches de cette espèce:

Souches n° 313: L.S.H.T.M.
314: ,,
315: ,,

Les souches dont nous n'avons pas précisé l'origine et qui sont morphologiquement très différentes des espèces types, ont cependant été incluses dans les expériences. Elles permettent d'utiles comparaisons de caractères. Par ailleurs, il se révèlera que les différences morphologiques s'accompagnent de différences physiologiques non moins nettes.

II. Etude morphologique des colonies

1°) Milieux de culture.

a) Gélose glucosée de Sabouraud (classique).

b) Bouillon de viande peptoné et gélosé (classique).

c) Milieu pommes de terre, glycériné (extrait de 200 g de pommes de terre; glycérine: 20 g; PO_4H_2K: 0,54 g; $PO_4H\ Na_2, 12H_2O$: 3,33 g; gélose: 20 g; eau: 1.000 g (pH 7,1).

d) Sérum glucosé de Loeffler (classique).

e) Milieu de Loewenstein-Jensen (classique).

2°) Technique: chaque milieu incliné est ensemencé en son centre par un fragment de colonie mère obtenue sur gélose glucosée de Sabouraud. Les cultures sont incubées pendant des temps variables à la température de 30°.

III. Etude du pouvoir protéolytique.

1°) Milieux de culture.

d) Sérum glucosé de Loeffler.

e) Milieu de Loewenstein-Jensen.

f) Milieu gélatiné en culot (peptone: 5 g; glucose: 20 g; gélatine: 150 g; eau: 1000 g (pH 7,2).

g) Milieu gélatine selon Frazier (1926) cité par Gordon & Mihm (1957). Nous avons modifié le milieu de Frazier en remplaçant la peptone et l'extrait de viande par une solution synthétique: PO_4 KH_2: 0,45 g; PO_4 Na_2H, $12H_2O$: 1,19 g; SO_4 Mg, $7H_2O$: 0,60 g; ClK: 1,00 g; Hydrolysat de caséine: 3,00 g; $PO_4H(NH_4)_2$: 1,00 g; glucose: 10 g; solution d'oligo-éléments: X gouttes; thiamine, pyridoxine, amide de l'acide nicotinique: 1.10^{-7}; biotine: 1.10^{-9}; gélose: 15,00 g; gélatine: 4 g; eau bidistillée: 1000 ml. Pour effectuer la révélation, on recouvre le milieu, après croissance des actinomycètes, avec la solution suivante: $HgCl_2$: 15,00 g; ClH concentré: 20 ml, eau: 1000 ml.

h) Milieu à l'albumine d'oeuf précipitée, selon GIOLITTI (1955)

Milieu A: PO_4 KH_2: 1,00 g; SO_4 Mg, $7H_2O$: 0,60 g; ClK: 1,00 g; glucose: 10,00 g; solution oligodynamique: X gouttes; thiamine, pyridoxine, nicotinamide: 1.10^{-7}; biotine: 1.10^{-9}; eau bidistillée: 800 ml.

Milieu B: ovalbumine pure cristallisée: 5,00 g dans quelques ml d'eau bidistillée; phénolphtaléine: 1 goutte; Na $OH\frac{N}{1}$: (± 2 ml) jusqu'à rosissement net du milieu. Compléter à 200 ml avec de l'eau bidistillée.

Le milieu A est réparti à raison de 16 ml pour les tubes de Legroux ou de 4 ml pour les tubes ordinaires, puis autoclavé à 110°. Le milieu B est autoclavé à part puis ajouté stérilement dans les tubes contenant le milieu A, à raison de 4 ml pour les tubes de Legroux ou 1 ml pour les tubes ordinaires. Il se produit lors du mélange, une précipitation fine de la protéine. Coucher les tubes. Laisser solidifier le milieu.

i) Milieu à la sérum-albumine de cheval purifiée (même technique que le précédent milieu, seule l'albumine est changée).

j) Lait écrémé tournesolé.

2°) Techniques: Les milieux de culture sont répartis, soit en culot, soit inclinés, soit à plat dans des tubes de Legroux (milieux h et i selon GIOLITTI et g selon FRAZIER). Ils sont ensemencés en un point (en deux points pour les tubes de Legroux) par un fragment de culture mère obtenue sur gélose de Sabouraud glucosée. Ils sont incubés à 30°. La liquéfaction plus ou moins intense du milieu de culture dans le cas du sérum coagulé, du milieu de Loewenstein ou de la gélatine en culot, indique la protéolyse (pour la gélatine en culot la lecture des résultats se fait après un court séjour des tubes à la glacière). Avec les milieux selon GIOLITTI (h et i) ou selon FRAZIER (g), la protéine hydrolysée figure un halo clair autour des colonies. Le diamètre du halo indique l'intensité de la protéolyse.

IV. Etude de l'utilisation des divers aliments azotés.

1⁰) Milieux.

k) PO_4KH_2: 0,45 g; $PO_4Na_2H, 12H_2O$: 1,19 g; SO_4Mg: 0,60 g; ClK: 1,00 g; solution oligodynamique: X gouttes; glucose pur: 10 g; thiamine, pantothénate de Ca, nicotinamide, pyridoxine: 1.10^{-7} biotine: 1.10^{-9}; gélose lavée: 15 g; eau distillée dans le verre Pyrex: 1000 ml (pH 6.8). Pour quelques expériences, certaines modifications à ce milieu ont été apportées (PO_4 KH_2: 0,54 g; PO_4 $Na_2H, 12H_2O$: 3,33 g; ClK: 2,5 g). Ce milieu donnait un précipité qui, sans être nuisible, s'avérait cependant gênant.

Les composés azotés à expérimenter sont ajoutés au milieu avant autoclavage. L'une des substances suivantes est ajoutée de façon à réaliser la concentration de 0,5 g d'azote par litre de milieu: hydrolysat de caséine: 0,31 %; asparagine purifiée: 0,26 %; urée: 0,11 %; $SO_4(NH_4)_2$: 0,24 %; PO_4 $H(NH_4)_2$: 0,23 %; NO_3K: 0,35 %; NO_2Na: 0,25 %; NO_3NH_4: 0,14 %.

Trois séries témoins sont prévues: Milieu glucosé sans azote; milieu non glucosé avec hydrolysat de caséine (0,31 %) et milieu non glucosé avec asparagine (0,26 %). Ces deux derniers milieux permettent de savoir si l'hydrolysat de caséine ou l'asparagine peuvent éventuellement être utilisés comme unique aliment azoté *et* carboné. Cette précision est importante à connaître pour les expériences sur l'utilisation des divers composés carbonés.

2⁰) Techniques: Les milieux sont répartis en tubes de 17 × 170 mm puis stérilisés à l'autoclave et inclinés. L'ensemencement se fait en un point, par un petit fragment de colonie mère obtenue sur gélose Sabouraud glucosée. Cet inoculum (± 2 mm × 2 mm) ne doit entraîner avec lui aucune trace du milieu d'où il provient. Dans quelques expériences (*Nocardia asteroides* et *N. brasiliensis*), l'inoculum consistait en une goutte de suspension de germes non lavés. L'expérience a montré que le premier inoculum mentionné ci-dessus est correct et qu'il n'implique pas plus de causes d'erreurs que le second. La présence de témoins empêche tout risque d'erreurs dû à l'inoculum.

Les cultures sont effectuées, pour chacune des expériences, sur 3 à 5 tubes du même milieu. Après ensemencement, les tubes sont capuchonnés et incubés à 25° (*N. asteroides* et *N. brasiliensis*) ou à 30° (*S. madurae*, *S. pelletieri* et *S. somaliensis*) pendant des temps variables suivant les espèces. La croissance est périodiquement estimée; le développement des cultures est apprécié comparativement aux cultures témoins en considérant le diamètre et l'épaisseur des colonies obtenues. Le développement sur un milieu donné (donc éventuellement l'utilisation ou la non utilisation du composé considéré) est rendu comme suit: 0 = développement nul (pas d'utilisation); 1: développement très pauvre (probablement pas d'utilisation); 3: faible développement (faible utilisation); 5: développement moyen (utilisation moyenne); 7: bon développement (bonne utilisation).

V. Etude de l'utilisation des divers aliments carbonés.

Les méthodes sont semblables à celles qui sont employées pour l'étude de l'utilisation des aliments azotés.

1⁰) Milieux.

1) Le milieu de base synthétique est le même que celui mentionné en IV, mais le glucose est absent. Il contient en revanche un aliment azoté convenable, non utilisable comme aliment carboné mais propre au développement des souches expérimentées. Cet aliment azoté est donc, soit de l'hydrolysat de caséine à 0,31 % pour les rares souches exigeant l'azote aminé pour leur développement, soit de l'asparagine à 0,1 %, soit enfin du phosphate biammoniacal (0,23 %) quand l'asparagine peut être utilisée comme aliment carboné. Les différents composés expérimentés figurent dans les tableaux.

2⁰) Techniques: Les sels d'acides organiques sont additionnés aux milieux à raison de 0,2 %; les autres composés carbonés à raison de 1 %. Les composés carbonés à étudier sont ajoutés a) soit aseptiquement après leur stérilisation par filtration (expériences sur *Nocardia asteroides* et *N. brasiliensis*); b) soit avant tyndalisation à 100° pour les composés hydrolysables ou stérilisation à 110° pour les composés non hydrolysables (expériences avec *Streptomyces madurae, S. pelletieri* et *S. somaliensis*). L'expérience à montré en effet que la technique de tyndalisation des composés hydrolysables donnait des résultats tout à fait comparables à ceux obtenus par la technique de filtration. Après stérilisation, les tubes contenant les milieux sont inclinés. Les techniques d'inoculation, de culture, d'interprétation des résultats, sont identiques à celles mentionnées plus haut pour l'utilisation des aliments azotés.

Il convient ici d'ajouter la technique employée pour juger de l'utilisation éventuelle de la paraffine. Un milieu synthétique liquide de même formule que celui mentionné plus haut, mais ne contenant ni carbone, ni azote, est réparti en tubes ou en fioles d'Erlenmeyer puis autoclavé. On ajoute ensuite stérilement un batonnet de verre paraffiné, stérile. Après ensemencement, la culture, quand elle a lieu, s'observe sur le baton de verre paraffiné ou éventuellement au sein du milieu liquide.

Résultats

I. *Nocardia asteroides* Eppinger.

N. asteroides est un actinomycète capable de provoquer soit des mycétomes soit, plus fréquemment, des nocardioses viscérales. Dans le mycétome, le „grain" qui est une concrétion du parasite centrant une réaction inflammatoire, est seulement un lâche lacis de filaments actinomycosiques. Ces filaments, qui peuvent aisément se fragmenter en éléments coccoïdes ou bacilliformes, sont gram positifs et partiellement acido-résistants. Dans les nocardioses viscérales, c'est le plus souvent sous forme de filaments plus ou moins fragmentés que l'on observe le parasite.

En culture, l'aspect des colonies de *N. asteroides* varie suivant les souches et suivant les milieux. Cependant, comme nous le verrons ci-dessous, quelques caractères principaux peuvent être retenus. Au microscope on observe des filaments ramifiés à extrémités parfois renflées; le diamètre des filaments varie autour de 0,5 μ. Dans les très jeunes cultures les filaments ne sont pas fragmentés; ils se fragmentent rapidement avec le vieillissement de la culture. Les souches de *N. asteroides* sont expérimentalement pathogènes.

1°) Morphologie macroscopique.

Gélose Sabouraud glucosée: la colonie est de consistance molle, presque crémeuse, quelques souches présentent une consistance plus dure. La couleur varie du blanc à peine teinté de jaune ou d'ocre à un orange vif presque rouge ou à un ocre foncé. La surface est mate et marquée de plis assez peu profonds; elle est parfois recouverte d'une pulvérulence blanchâtre. La croissance est bonne sur ce milieu.

Bouillon de viande gélosé: La culture sur ce milieu se développe bien. La colonie est fréquemment peu colorée ou à peine rosâtre. On note parfois la présence d'une pulvérulence blanche.

Sérum coagulé glucosé: La croissance est dans l'ensemble faible sur ce milieu. Les colonies sont non pigmentées ou à peine teintées de jaune. Certaines souches sont cependant plus pigmentées d'orange (n° 336, 318 et 328).

Milieu de Loewenstein-Jensen: La croissance est excellente sur ce milieu. Les colonies sont plates et finement plissées; elles sont pigmentées en jaune-rosé ou jaune ocré. La souche 322 donne un mycélium aérien blanc. Certaines souches, par une alcalinisation du pH, décolorent complètement le vert malachite qui devient jaune (n° 333 et 85); d'autres ne le décolorent que partiellement (n° 328, 318 et

336). La souche aberrante (n⁰ 349) accentue au contraire la coloration verte du milieu.

2⁰) Action protéolytique.

Le pouvoir protéolytique des diverses souches de *N. asteroides* est nul. Un tableau n'est donc pas nécessaire pour résumer les expériences. Hormis la souche aberrante qui hydrolyse la gélatine, les différents isolements, bien que donnant une croissance appréciable ou bonne sur tous les milieux, n'hydrolysent pas la gélatine, ni la sérum-albumine de cheval (sérum coagulé ou sérum-albumine précipitée) ni l'ovalbumine (milieu de Loewenstein ou ovalbumine précipitée).

Les cultures sur lait tournesolé ne changent que peu l'aspect du milieu. Dans quelques cas il y a alcalinisation (souches n⁰ 336, 358 et 360). La souche aberrante (n⁰ 349) alcalinise le lait et le coagule.

3⁰) Utilisation des composés azotés (Tableau I-A).

Les résultats du tableau I-A sont lus après 30 jours de séjour à l'étuve à 25°. Ils montrent tout d'abord que la souche aberrante (n⁰ 349) se singularise par ses divers caractères. Pour les autres souches, d'une façon générale, l'azote de l'hydrolysat de caséine, de l'asparagine et de l'urée est très bien utilisé. Le $PO_4\ H(NH_4)_2$ et le NO_3K sont également bien utilisés par toutes les souches. Le sulfate et le nitrate d'ammonium sont utilisés par certaines souches (et cela plus ou moins bien) et ne sont pas utilisés par d'autres. Le nitrite de sodium ne permet aucun développement des différentes souches.

Sur les divers milieux où l'on observe une croissance, le pigment de la colonie varie suivant les souches mais non suivant le composé azoté. Certaines colonies sont plus teintées de jaune ou de rouge, mais on ne note aucun caractère nettement marqué. De même, la présence d'un pigment brun soluble, se remarque dans tous les milieux où une croissance suffisante est notée.

Des cultures sur milieu à la tyrosine, fabriqué selon la technique de WAKSMAN (1950) ne démontrent aucune production de tyrosinase par les diverses souches de *Nocardia asteroides*.

4⁰) Utilisation des composés carbonés (Tableau I-B).

Notons tout d'abord que la souche morphologiquement différente se sépare des autres isolements par le fait qu'elle n'utilise pas la paraffine, mais utilise bien l'amidon. Pour les autres souches, à une exception près, les sels d'acides organiques ne sont pas utilisés par les souches de *N.*

TABLEAU I.

		Souches N^0											
		318	85	302	328	336	333	322	358	360	320	349*	369
A)	Hydrolysat de caséine	7	7	7	7	7	7		7	5	7	7	
	Asparagine	7	7	7	7	7	7		7	7	7	5	5
	Urée	7	7	7	7	7	7		7	5	3	1	
	$SO_4(NH_4)_2$	3	1	5	1	3	3		7	5	7	1	5
	$PO_4H(NH_4)_2$	5	7	7	5	7	7		7	7	5	1	
	NO_3NH_4	3	1	5	5	5	3		7	5	7	1	5
	NO_3K	5	7	3	5	5	5		7	7	7	1	
	NO_2Na	0	0	0	0	0	0		0	0	0	1	
	Témoin	0	0	0	0	0	0		1	0	0	0	0
B)	Acétate de Na	0	0	0	0	5	1	1	0	0	0	1	
	Tartrate de Na	0	0	0	0	0	1	1	0	0	0	1	
	Citrate de Na	1	0	0	1	0	1	1	0	0	1	1	
	l. arabinose	0	0	0	0	0	1	1	0	0	0	0	
	d. xylose	1	0	0	0	0	1	1	0	0	0	1	
	d. glucose	7	7	7	7	7	7	7	7	7	7	5	5
	d. lévulose	7	7	7	5	7	7	7	7	7	0	5	7
	d. galactose	0	0	0	0	1	1	1	0	0	0	1	0
	Saccharose	0	0	0	0	0	1	1	0	0	0	0	
	Maltose	0	0	0	0	0	5	1	0	0	1	5	
	Lactose	0	0	0	0	0	1	1	0	0	0	1	
	Amidon	0	0	0	0	0	1	1	0	3	1	5	
	Mannitol	7	0	7	7	0	1	7	7	0	0	0	
	Glycérol	7	0	7	7	1	7	7	7	0	7	5	[illegible]
	Témoin	0	0	0	0	0	0	0	0	0	0	0	0
	Paraffine	5	5	5	5	5	5	5	5	3	5	0	5

Utilisation de divers composés azotés et carbonés par *Nocardia asteroides*.
La lecture des résultats a été faite après 30 jours de séjour à l'étuve à 25°.
L'astérisque (*) marque la souche morphologiquement aberrante.
La source de carbone en A) est du glucose, la source d'azote en B) est de l'asparagine 1 $^0/_{00}$.
0 : pas de croissance, pas d'utilisation
1 : croissance très faible, pas d'utilisation
3 : croissance faible, faible utilisation
5 : croissance et utilisation moyennes
7 : bonne croissance, bonne utilisation

asteroides étudiées. Parmi les sucres, seuls le glucose et le lévulose sont bien utilisés; les autres ne le sont pas ou le sont seulement dans de rares cas. L'amidon n'est faiblement utilisé que par une souche (n^0 360). Cinq souches utilisent le mannitol et huit utilisent le glycérol.

Il est à remarquer que la souche n^0 320 est seule à ne pas utiliser le lévulose. Nous avons signalé par ailleurs (F. MARIAT et al. 1955) que cette souche, isolée d'une nocardiose cérébrale (TESTARD et al 1954), avait une morphologie et une physiologie légèrement particularisée mais qu'il convenait de la maintenir cependant dans l'espèce *N. asteroides*.

La paraffine est utilisée par toutes les souches étudiées (sauf la souche n° 349).

L'aspect général du tableau I-B montre que peu de composés sont, dans l'ensemble, capables dans les conditions de l'expérience, de permettre la croissance des souches de l'espèce *N. asteroides*. Comme dans le cas de composés azotés, on n'observe pas de variations notables de la couleur en fonction de la qualité de l'aliment carboné. Le pigment soluble brun n'est présent que dans les tubes où il y a croissance suffisante. La pulvérulence blanchâtre apparaît sur la surface des colonies de la souche 333 mais seulement sur les milieux où la croissance est faible; elle est inexistante en présence de glucose. Pour les souches 336 et 322, la pulvérulence apparaît au contraire dans les tubes où le développement est bon.

II. *Nocardia brasiliensis* (LINDENBERG) CASTELLANI et CHALMERS.

Cette espèce est considérée par quelques auteurs comme synonyme de la précédente. Tel n'est pas notre avis ni celui de divers autres travailleurs (ALMEIDA & LACAZ, 1941; GONZALES OCHOA, 1945). Cet actinomycète provoque des mycétomes particulièrement fréquents en Amérique centrale ou en Amérique du sud. Des mycétomes dûs à *N. brasiliensis* ou à ses variétés, sont signalés en Amérique du nord ou en Afrique. Dans le pus qui sourd des nombreuses fistules du mycétome, on trouve des grains de couleur jaunâtre, rarement massués. Ces grains sont de taille moyenne et de forme irrégulière; ils semblent souvent constitués de lobes. En culture, l'aspect des colonies est variable suivant les souches et suivant les milieux. L'aspect microscopique de *N. brasiliensis* est voisin de celui de *N. asteroides*. Comme cette dernière espèce, *N. brasiliensis* est partiellement acido-résistant. La fragmentation du mycélium est moins prononcée. Le pouvoir pathogène de cet actinomycète est discuté.

1°) Morphologie macroscopique.

Gélose Sabouraud glucosée: Sur ce milieu, la plupart des souches expérimentées donnent des colonies surélevées, à croissance rapide, de couleur jaune ocré ou ocre-rouge plus ou moins accentuée. La surface de la colonie est mate et fréquemment parcourue de sillons plus ou moins profonds, d'amplitude variable, à arrêtes vives. Une pulvérulence blanche recouvre souvent, tout ou partie de la colonie. Celle-ci est dure et cassante.

Bouillon de viande gélosé: Le développement des cultures sur ce milieu est en général réduit. Les colonies sont, suivant les souches, de couleur rose à tango; quelquefois ocre. Certaines de ces souches donnent une pulvérulence blanche sur la surface de la colonie.

Milieu pommes de terre glycériné: Les cultures se développent bien sur ce milieu, elles sont pigmentées de jaune ou de tango. Certaines souches donnent une pulvérulence blanche.

Milieu de Loewenstein-Jensen: Ce milieu est favorable à la croissance des diverses souches. Les colonies se présentent sous forme de voile plissé de couleur jaune orangé à ocre. La couleur est quelquefois difficile à définir. Certaines souches donnent une abondante pulvérulence blanchâtre. Avec quelques souches on observe une décoloration du vert malachite.

2^0) Action protéolytique.

L'action protéolytique des souches de cette espèce se manifeste surtout par une hydrolyse de la gélatine décelable, avec les diverses techniques, l'hydrolyse de la gélatine est un des importants caractères qui différencient cette espèce de l'espèce précédente *N. asteroides*.

Tableau II.

N⁰ des Souches	352	357	347	344	348	346	345	351	342*	343*	370	371
Hydrolyse de la gélatine . . . (diverses techniques)	+	+	+	+	+	+	+	+	+	+	+	+
Liquéfaction du sérum coagulé.	0	0	0	0	0	0	0	0	+	+	+	+
Hydrolyse de la sérum-albumine précipitée	0	+	+	0	0	+	+	0	+	+	+	+
Liquéfaction du Loewenstein .	0	0	±	0	0	0	0	0	0	0	0	0
Hydrolyse de l'ovalbumine précipitée	0	±	0	±	0	0	0	0	0	0	0	0

Action protéolytique des souches de *Nocardia brasiliensis*

0 : pas d'hydrolyse
± : faible hydrolyse
+ : hydrolyse

*) Les souches marquées d'un astérisque sont morphologiquement différentes de l'espèce type.

Bien que le développement sur sérum coagulé soit bon, on n'observe d'hydrolyse que pour quatre souches, dont deux sont aberrantes. Avec la technique utilisant la sérum-albumine précipitée, les mêmes souches donnent des halos d'hydrolyse très appréciables (20 à 40 mm de diamètre). Des souches n'hydrolysant pas le sérum coagulé (n⁰ 357, 347, 346 et 345), donnent également un halo d'hydrolyse de la sérum albumine précipitée.

Sur Loewenstein, seule la souche 347 permet une légère hydrolyse. En présence d'ovalbumine précipitée, les souches 357 et 344 (mais non la souche 347!) donnent une très faible hydrolyse que signale un halo de 1 mm de large autour de la colonie. Sur les milieux synthétiques contenant les albumines précipitées, la croissance n'est bonne que lorsqu'il y a hydrolyse; dans le cas contraire la croissance est faible.

Le lait tournesolé est toujours alcalinisé, souvent peptonisé (n° 352, 357 et 351) ou coagulé (n° 352, 346, 345 et souches aberrantes 342 et 343). Les différents changements qui s'opèrent dans le lait tournesolé sont difficiles à noter avec précision. Les différents enzymes interviennent plus ou moins simultanément et souvent, seule la peptonisation est visible.

3°) **Utilisation des composés azotés** (Tableau III-A).

Les souches n° 342 et 343 qui sont morphologiquement aberrantes, se singularisent en ne donnant aucune croissance en présence de NO_3K alors que les autres souches utilisent très bien ce composé. Une de ces souches (n° 343) n'utilise pas le phosphate d'ammonium. Ces isolements sont respectivement incolores et bruns sur les divers milieux où ils se développent.

Hormis le nitrite qui se montre toxique, tous les autres composés azotés sont bien utilisés par les diverses souches étudiées. En présence des divers composés, la pigmentation des souches en général est l'ocre ou le rose-jaune.

Toutes les souches sauf deux (n° 352 et 357) libèrent, dans les milieux sur lesquels elles se développent, un pigment soluble brun. Parmi les souches étudiées, beaucoup présentent un duvet blanchâtre (souches n° 357, 345, 342 et 343). Aucune des souches figurant dans ce tableau ne produit de tyrosinase.

4°) **Utilisation des composés carbonés** (Tableau III-B).

L'asparagine s'étant révélée incapable d'être utilisée comme unique aliment carboné, c'est ce composé qui, à la concentration de 1 ‰ est employé comme source d'azote pour cette série d'expériences. Les résultats mentionnés dans le tableau, sont lus après 30 jours d'incubation des cultures à 25°.

Les deux souches aberrantes (n° 342 et 343) se distinguent des autres isolements par plusieurs caractères dont la non utilisation de la paraffine. La souche 342 est blanche par un abondant duvet; la souche n° 343 est brune.

Les sels d'acides organiques sont utilisés par différentes souches. De nombreux sucres permettent la croissance.

Tableau III.

		Souches N°											
		352	357	347	344	348	346	345	351	342*	343*	370	371
A)	Hydrolysat de caséine	7	7	7	7	7	7	7	7	7	7		
	Asparagine	7	7	7	5	7	7	5	7	7	7	7	7
	Urée	7	7	7	5	7	7	7	7	7	7		
	$SO_4(NH_4)_2$	7	7	7	7	7	7	7	7	5	7	3	3
	$PO_4H(NH_4)_2$	7	7	7	7	7	5	7	7	7	0		
	NO_3NH_4	7	7	7	7	5	3	5	7	3	7	5	3
	NO_3K	7	7	7	7	7	7	7	7	0	0		
	NO_2Na	0	0	0	0	0	0	0	0	0	0		
	Témoin	0	0	0	0	0	0	0	0	0	0	0	0
B)	Acétate de Na	1	3	3	3	1	3	3	1	1	3		
	Tartrate de Na	1	3	3	3	1	3	1	1	1	3		
	Citrate de Na	1	3	3	3	1	3	1	1	1	3		
	l. arabinose	5	5	1	5	5	5	3	1	0	3		
	d. xylose	1	5	5	3	1	3	1	3	7	7		
	d. glucose	7	7	7	7	7	7	7	7	7	7	7	7
	d. lévulose	7	7	7	7	7	7	7	7	7	7	7	5
	d. galactose	7	7	7	7	7	7	7	7	7	7	7	7
	Saccharose	3	3	1	5	3	7	1	5	1	5		
	Maltose	3	3	1	3	3	7	1	5	7	7		
	Lactose	1	3	1	3	1	3	1	1	7	7		
	Amidon	1	5	3	3	1	3	1	1	7	7		
	Mannitol	7	7	7	5	7	7	7	7	7	7	7	7
	Glycérol	7	7	7	7	7	7	7	7	7	7	7	7
	Témoin	0	0	0	0	0	0	0	0	0	0	1	1
	Paraffine	5	5	5	5	5	5	5	5	0	0	5	5

Utilisation des composés carbonés et azotés par *Nocardia brasiliensis*

La lecture des résultats a été effectuée après 30 jours de séjour à l'étuve à 25°. L'astérisque (*) marque les souches morphologiquement aberrantes.

0 : pas de croissance, pas d'utilisation
1 : croissance très faible, pas d'utilisation
3 : croissance faible, faible utilisation
5 : croissance et utilisation moyennes
7 : bonne croissance, bonne utilisation

Il convient de noter tout particulièrement l'utilisation du galactose par toutes les souches de cette espèce. Ce caractère très net, distingue cette espèce de l'espèce précédente *N. asteroides*.

Dans l'ensemble, l'amidon est mal utilisé, sans doute parce que insuffisamment ou non hydrolysé. Le mannitol et le glycérol sont utilisés par toutes les souches.

La paraffine est utilisée par toutes les souches caractérisées. Sur tous les milieux, la couleur dominante de la colonie est l'ocre. Un pigment brun soluble est présent dans tous les tubes où il y a développement et ce, pour la quasi totalité des souches. Diverses souches forment un duvet en plus ou moins grande abondance. Les sucres bien utilisés (glucose, lévulose, galactose) semblent favoriser la formation de ce duvet.

III. *Streptomyces madurae* (VINCENT) GONZALES OCHOA et SANDOVAL.

Cet actinomycète est l'agent d'un mycétome cosmopolite à grain blanc plus ou moins teinté de rouge. Il a longtemps été classé dans le genre *Nocardia*, mais la présence de chaînettes de spores, observées par GONZALES OCHOA & SANDOVAL (1955) dans des cultures obtenues sur milieu aux grains de blé, le classe dans le genre *Streptomyces*.

Le „grain" parasitaire est de grande taille et peut atteindre le volume d'un pois. Les bords du grain sont lobés et souvent ornés de franges ou „pseudo-massues", longues, étroites et bifurquées. Nous avons également observé des massues courtes et ovoïdes.

Les filaments qui forment ce grain, aussi bien que ceux que l'on observe en culture, ne sont pas acido-résistants; ils ne se fragmentent pas. Le pouvoir pathogène expérimental de cet actinomycète est nul, cependant CATANEI (1942) a obtenu des souches expérimentalement pathogènes.

1°) Morphologie macroscopique.

Les souches de cette espèce demandent une température de 30 à 37° pour bien se développer. A partir du grain parasitaire, il faut souvent de longs délais (15 jours et plus) pour observer la première manifestation de croissance.

Gélose Sabouraud glucosée: La colonie ressemble à une membrane de consistance élastique. Elle est plissée ou cérébriforme; son relief est parfois très prononcé. La couleur varie suivant les souches du blanc presque pur au rose et même quelquefois au rouge. La surface de la colonie est brillante et cireuse. On observe très rarement la formation de duvet.

Gélose au bouillon de viande: Le développement sur ce milieu varie suivant les souches. Les colonies y sont en général finement granuleuses et aplaties sur le milieu. La couleur est toujours blanc-crème.

Pomme de terre glycérinée-gélosée: Milieu permettant un bon développement des cultures. Les colonies y sont plus ou moins plissées ou mamelonnées; elles sont blanches, quelquefois teintées ou bordées de rose.

Milieu de Loewenstein-Jensen: Les souches de cette espèce se développent bien sur ce milieu où les colonies deviennent cérébriformes, de couleur blanche, quelquefois jaunâtre. Le vert malachite est souvent décoloré.

2⁰) Action protéolytique.

Pour beaucoup de souches de *S. madurae* l'hydrolyse des milieux classiques (gélatine-peptone par exemple) est faible et quelquefois décelable seulement après de longues cultures. La mise en oeuvre des techniques utilisant des protéines précipitées permet de noter les phénomènes avec beaucoup plus de facilité et surtout de précision.

Tableau IV.

N⁰ des Souches	83	306	307	332	334	338	339	340	341	356*	359*	353	363	364	366
Liquéfaction de la gélatine (gélatine-peptone en culot)	±	+	±	±	0	±	±	+	±	+	0	+	±	±	±
Hydrolyse de la gélatine (milieu gélose-gélatine)	+	+	+	+	+	+	+	+	+		0	+	+	+	+
Liquéfaction du sérum coagulé	0	+	0	±	0	+	+	+	+	+	0	+	0	0	0
Hydrolyse de la sérum albumine précipitée	0	+	+	+	+	+	+	+	+		0	+	+	0	±
Liquéfaction du Loewenstein	0	0	0	0	0	0	0	0	0	±	0	0	0	0	0
Hydrolyse de l'ovalbumine précipitée	0	0	0	0	0	0	0	±	0	±	0	0	0	0	0

Action protéolytique des souches de *Streptomyces madurae*

0 : pas d'hydrolyse
± : faible hydrolyse
+ : hydrolyse

Les souches marquées d'un astérisque sont morphologiquement aberrantes.

La culture sur le milieu synthétique gélatine-gélose (milieu g) confirme le fait que le milieu gélatine-peptone en culot, permet de suspecter: les diverses souches de *S. madurae* hydrolysent la gélatine.

L'hydrolyse du sérum coagulé par huit souches est confirmé par l'épreuve sur milieu à la sérum-albumine précipitée. Pour trois autres souches ce milieu a permis de mettre en évidence une hydrolyse de la sérum-albumine non détectable avec le sérum coagulé. Il convient dans les deux cas de faire des lectures après un mois ou même deux mois de culture.

L'ovalbumine n'est faiblement hydrolysée que par deux souches dont une seulement hydrolyse la protéine précipitée et le milieu de Loewenstein. Sur le milieu à l'ovalbumine précipitée, la souche 340 donne une très faible digestion de la protéine décelable seulement sous la colonie.

Le lait tournesolé est presque toujours alcalinisé, quelquefois peptonisé.

3⁰) **Utilisation des composés azotés** (Tableau V-A).

La source de carbone du milieu de base utilisé dans cette expérience, est du glucose à la concentration de 1 %. Les résultats sont notés après six semaines de culture à 30°. Les deux souches morphologiquement aberrantes ne se développent qu'en présence d'hydrolysat de caséine (n⁰ 356 et 359) ou d'asparagine (n⁰ 356). Les autres composés sont impropres à leur croissance. Les composés azotés organiques sont diversement utilisés. Ils permettent le plus souvent une bonne croissance. Cependant certaines souches ne semblent pas utiliser l'hydrolysat de caséine (n⁰ 83, 334 et 366). Toutes les souches caractéristiques utilisent bien le phosphate d'ammonium.

L'aspect et la couleur des colonies ne varient pas selon le composé azoté. Seule la souche morphologiquement aberrante n⁰ 356 forme un duvet en culture, en présence d'hydrolysat de caséine. La souche n⁰ 363 forme un léger pigment brun soluble dans les tubes contenant de l'hydrolysat de caséine ou de l'asparagine. Aucune des souches étudiées ne synthétise de tyrosinase.

4⁰) **Utilisation des composés carbonés** (Tableau V-B).

L'hydrolysat de caséine et l'asparagine peuvent être faiblement utilisés par quelques souches comme unique aliment carboné. Le milieu de base est donc constitué avec du phosphate d'ammonium comme source d'azote (0,23 %). Le précipité qui se forme ne modifie pas les qualités du milieu de base. Pour les souches n⁰ 356 et 359 qui ne se développent pas en présence d'azote minéral, le milieu de base contient de l'hydrolysat de caséine (0,31 %).

Les souches aberrantes n⁰ 356 et 359 se particularisent par divers caractères que l'on relèvera dans le tableau. Pour les autres isolements, les propriétés suivantes sont observées: Le citrate et l'acétate de sodium sont modérément utilisés par quelques souches. Le xylose est en général utilisé: une souche cependant ne se développe pas en sa présence (n⁰ 366). Le glucose et le lévulose sont bien utilisés par toutes les souches.

Cinq souches ne peuvent utiliser le galactose, trois ne peuvent utiliser le saccharose, trois ne peuvent utiliser le maltose. Le lactose permet la croissance de sept souches. L'amidon, le mannitol, le glycérol sont utilisés plus ou moins par toutes les souches. La paraffine ne permet aucune croissance des souches expérimentées.

On n'observe aucune modification importante de l'aspect général ou de la couleur de la colonie en fonction du composé carboné. Le seul caractère variable est le relief de la colonie qui est plus ou moins accentué, avec des plis plus ou moins profonds; le relief dépend très certainement de l'intensité de croissance des germes.

Tableau V.

		Souches N^0														
		83	306	307	332	334	338	339	340	341	356*	359*	353	363	366	364
A)	Hydrolysat de caséine	1	7	7	7	1	5	5	5	7	7	7	5	7	1	
	Asparagine	1	7	7	5	0	7	7	7	7	3	0	7	5	1	
	Urée	3	5	7	7	5	5	5	7	7	0	0	7	7	5	
	$SO_4(NH_4)_2$	1	3	3	1	1	1	3	5	1	0	0	5	3	0	
	$PO_4H(NH_4)_2$	7	7	7	7	7	7	5	7	7	0	0	7	7	5	
	NO_3NH_4	1	3	3	1	1	3	3	5	3	0	0	5	3	0	
	NO_3K	3	1	1	7	3	3	3	5	3	0	0	7	5	1	
	NO_2Na	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Témoin	1	1	1	1	0	1	1	1	1	0	0	0	0	0	
B)	Acétate de Na	3	3	5	1	1	1	3	3	5	0	3	3	5	3	5
	Tartrate de Na	0	0	1	0	0	1	1	1	0	1	3	0	1	0	1
	Citrate de Na	1	1	5	3	1	5	3	1	3	1	3	5	1	0	3
	l. arabinose	0	5	5	1	1	5	3	3	1	0	3	1	0	0	1
	d. xylose	5	7	7	3	5	5	5	5	7	0	3	7	5	0	5
	d. glucose	5	7	7	5	5	7	7	7	7	7	7	7	7	5	7
	d. lévulose	3	5	7	3	3	5	5	5	5	0	5	3	5	3	5
	d. galactose	3	3	1	1	3	5	7	3	1	1	5	1	7	0	5
	Saccharose	1	5	7	3	0	1	5	3	5	0	7	5	5	5	3
	Maltose	1	3	5	3	5	1	3	1	5	1	5	3	3	3	3
	Lactose	0	3	5	1	1	3	5	1	3	0	3	5	5	1	1
	Amidon	3	5	7	3	5	7	7	3	7	0	5	5	7	5	7
	Mannitol	3	5	5	3	3	7	7	3	7	1	3	3	5	5	7
	Glycérol	3	7	5	5	3	7	5	7	7	1	7	5	7	5	5
	Témoin	0	0	0	0	0	0	0	0	1	0	3	0	1	0	1
	Paraffine	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Utilisation de divers composés azotés et carbonés par *Streptomyces madurae*

La lecture des résultats mentionnés dans ce tableau a été effectuée après 6 semaines pour la nutrition azotée et 8 semaines pour la nutrition carbonée, de séjour à l'étuve à 30°. Les astérisques (*) marquent les souches morphologiquement aberrantes.

0 : pas de croissance, pas d'utilisation
1 : croissance très faible, pas d'utilisation
3 : croissance faible, faible utilisation
5 : croissance et utilisation moyennes
7 : bonne croissance, bonne utilisation

IV. *Streptomyces pelletieri* (LAVERAN) WAKSMAN.

Ce microorganisme est l'agent d'un mycétome particulièrement fréquent en Afrique et caractérisé par un pus à „grains" rouges. Nous avons regroupé dans cette espèce, les souches décrites comme appartenant à l'espèce *S. africanus* (souches n^0 84, 326 et 362).

Les „grains" rouges parasitaires sont nombreux et de petite taille (± 500 μ). Les bords des grains sont lisses ou finement denticulés, jamais massués. Dans le grain (aussi bien qu'en culture d'ailleurs), les filaments sont non fragmentés; ils sont gram positifs et non acido-résistants.

Le pouvoir pathogène expérimental de *S. pelletieri* est nul.

1°) Morphologie macroscopique.

Les actinomycètes de cette espèce préfèrent une température de 30° à 37° pour se développer.

Gélose Sabouraud glucosée: Les cultures prennent sur ce milieu une belle couleur rose-corail ou rouge. Les colonies de consistance dure se développent lentement; elles sont peu étendues sur la surface du milieu mais fréquemment surélevées en pic.

Gélose au bouillon de viande: Sur ce milieu la croissance est moyenne ou bonne; les colonies y sont non pigmentées ou seulement teintées de rose. On observe quelquefois une légère pulvérulence blanche ou rosée.

Pomme de terre glycérinée gélosée: Ce milieu donne des cultures de développement variable. La colonie est le plus souvent plate et étalée, comme composée de nombreuses micro-colonies. Le pigment ne s'observe le plus souvent que dans le fragment d'inoculum. Quelques souches, cependant, se colorent totalement en rose ou même en rouge. On note quelquefois la présence de filamentation aérienne.

Les milieux contenant des protéines (sérum coagulé et Loewenstein-Jensen) sont fortement hydrolysés et ne permettent pas d'observer utilement la morphologie des colonies.

2°) Action protéolytique (Tableau VI).

Si l'on exclut la souche n° 310 qui est morphologiquement très éloignée de l'espèce type, les divers isolements de l'espèce *S. pelletieri* font preuve d'une forte action protéolytique. La souche 354 qui n'hydrolyse ni le sérum coagulé ni le milieu de Loewenstein, se montre cependant capable d'hydrolyser les protéines précipitées et tout particulièrement la sérum-albumine (diamètre moyen des halos 18 mm). Le lait tournesolé est en général alcalinisé et peptonisé sans que l'on puisse noter de coagulation préalable.

TABLEAU VI.

N⁰ des souches	89	309	308	310*	354	84	326	362	372	374
Hydrolyse de la gélatine . . . (diverses techniques)	+	+	+	+	+	+	+	+	+	+
Liquéfaction du sérum coagulé .	+	+	+	+	0	+	+	+	+	+
Hydrolyse de la sérum albumine précipitée	+	+	+	±	+	+	+	+	+	+
Liquéfaction du Loewenstein .	+	+	+	0	0	+	+	+	+	+
Hydrolyse de l'ovalbumine précipitée	+	±	+	0	±	+	+	+		

Action protéolytique des souches de *Streptomyces pelletieri*

0 : pas d'hydrolyse
± : faible hydrolyse
+ : hydrolyse
(*) souche morphologiquement aberrante

3⁰) **Utilisation des composés azotés** (Tableau VII-A).

La source de carbone du milieu de base est du glucose à la concentration de 1 %. Les résultats mentionnés dans le tableau VII-A ont été observés après 6 semaines de culture à 30⁰.

Hormis la souche morphologiquement aberrante, qui se singularise par le fait qu'elle ne se développe pas en présence d'hydrolysat de caséine, les souches étudiées font preuve d'une grande homogénéité dans l'utilisation des composés azotés. L'hydrolysat de caséine, l'asparagine, l'urée et le phosphate d'ammonium sont utilisés. Les autres composés ne permettent aucune croissance significative. Sur les divers milieux, la pigmentation des colonies varie du jaune-rosé au rouge vineux, en passant par le rose corail. La souche n⁰ 310, seule, est brune; elle synthétise en abondance un pigment soluble brun. En présence des composés organiques, les autres souches synthétisent également un léger pigment soluble.

Les diverses souches ne produisent pas de tyrosinase.

4⁰) **Utilisation des composés carbonés** (Tableau VII-B).

L'hydrolysat de caséine peut être faiblement utilisé comme unique aliment carboné. L'asparagine (1 ⁰/₀₀) qui ne peut jouer ce rôle, a donc été choisie comme substance azotée pour le mileu de base de cette série d'essais. Les résultats du tableau VII-B sont lus après 7 semaines de culture à 30°. La souche aberrante (n⁰ 310) se différencie très nettement des autres isolements par le fait qu'elle utilise presque tous les composés expérimentés.

Pour les souches caractéristiques, on retrouve, dans l'utilisation des composés carbonés, l'homogénéité que l'on observait pour l'utilisation des composés azotés. L'acétate de sodium est légèrement utilisé. Le glucose est bien utilisé par toutes les souches. Le lévulose n'est pas utilisé par deux des souches. Le saccharose n'est faiblement utilisé que par trois souches. Les autres composés ne sont pas utilisés. La souche n^0 354, morphologiquement conforme à l'espèce type mais qui est, nous l'avons vu plus haut, moins protéolytique que les autres souches, ne se développe bien qu'en présence du glucose et faiblement en présence de

TABLEAU VII.

		Souches N^0							
		89	309	308	310*	354	84	326	362
A)	Hydrolysat de caséine	5	7	7	0	7	7	5	7
	Asparagine	5	5	7	7	7	7	5	7
	Urée	7	7	5	7	7	7	7	7
	$SO_4(NH_4)_2$	0	0	0	0	0	0	0	0
	$PO_4H(NH_4)_2$	7	7	7	5	5	3	5	7
	NO_3NH_4	0	0	0	0	0	0	0	0
	NO_3K	1	1	0	0	1	0	0	0
	NO_2Na	0	0	0	0	0	0	0	0
	Témoin	1	0	0	0	0	0	0	0
B)	Acétate de Na	3		5	1	3	3	3	3
	Tartrate de Na	0	0	1	0	0	0	0	0
	Citrate de Na	0	0	1	1	0	0	0	0
	l. arabinose	0	0	1	0	0	0	0	0
	d. xylose	0	0	1	7	0	0	0	0
	d. glucose	7	5	7	7	7	7	7	7
	d. lévulose	3	5	7	7	1	0	3	7
	d. galactose	1	0	1	7	1	0	0	0
	Saccharose	3	1	3	0	1	0	1	3
	Maltose	0	0	1	7	0	0	0	1
	Lactose	0	0	1	7	0	0	0	0
	Amidon	0	0	1	7	0	0	0	0
	Mannitol	0	0	1	7	0	0	0	0
	Glycérol	1	5	0	7	0	1	1	3
	Témoin	0	0	1	0	0	0	0	0
	Paraffine	0	0	0	0	0	0	0	0

Utilisation de divers composés azotés et carbonés par *Streptomyces pelletieri*

La lecture des résultats mentionnés dans ce tableau a été effectuée après un séjour à l'étuve à 30°, de 6 semaines pour l'étude de la nutrition azotée et de sept semaines pour l'étude de la nutrition carbonée.

L'astérisque (*) marque la souche morphologiquement aberrante

0 : pas de croissance, pas d'utilisation
1 : croissance très faible, pas d'utilisation
3 : croissance faible, faible utilisation
5 : croissance et utilisation moyennes
7 : bonne croissance, bonne utilisation

l'acétate de sodium. La pigmentation de la colonie sur les divers milieux est toujours rose plus ou moins foncé (sauf la souche n⁰ 310 qui est brune). Dans le milieu à base d'acétate de sodium, la souche n⁰ 354 prend une pigmentation rouge vineux. Deux souches présentent une légère filamentation aérienne: la souche n⁰ 89 sur glucose et sur lévulose et la souche n⁰ 308 sur les milieux où s'observe une très faible croissance (acétate, tartrate et citrate de Na).

V. *Streptomyces somaliensis* (Brumpt) Waksman et Henrici

Cet actinomycète est l'agent d'un mycétome à grain jaunâtre, rencontré plus particulièrement en Afrique. Les grains parasitaires sont durs et comme constitués d'une substance amorphe ,,cimentant'' les filaments du microorganisme.
Le bord du grain est lisse.
Le thalle de *S. somaliensis* n'est pas fragmenté, il n'est pas acido-résistant. Dans certaines conditions de culture, on note la présence de chaînes de spores caractéristiques du genre *Streptomyces*. Le pouvoir pathogène expérimental de *S. somaliensis* est nul.
Nous n'avons pu malheureusement étudier que trois souches de cet actinomycète.

1⁰) Morphologie macroscopique.

S. somaliensis se développe sans difficultés sur les milieux usuels à des températures de 25—30°.

Gélose Sabouraud glucosée: Les cultures se développent rapidement sur ce milieu. La couleur de la colonie est d'abord blanche puis brune, pour devenir vite d'un beau noir bleuté. La surface mate est souvent ornée de très fins sillons. On observe par endroit la formation de mycélium aérien blanc qui donne une teinte grise à la colonie. La consistance de la colonie est celle d'une mince pellicule peu solide.

Gélose au bouillon de viande: Sur ce milieu les colonies sont plates, finement plissées, jaunes; seul l'inoculum reste noir.

Milieu pomme de terre, glycériné gélosé: Le développement des cultures est pauvre sur ce milieu. La colonie n'est pas pigmentée. De nombreuses micro-colonies satellites sont obtenues.

Milieu de Loewenstein et sérum coagulé: L'hydrolyse importante des milieux empêche toute observation utile.

2⁰) Action protéolytique.

Les diverses protéines offertes (gélatine, sérum-albumine, ovalbumine) sont rapidement et très fortement hydrolysées par les souches étudiées et ceci quelles que soient les techniques utilisées. Le lait tournesolé est alcalinisé et rapidement peptonisé sans que l'on note de coagulation préalable.

3°) **Utilisation des composés azotés** (Tableau VIII-A).

La source de carbone du milieu de base employé dans cette expérience est du glucose (1 %). Les résultats sont notés après six semaines de culture à 30°.
Les trois souches de *S. somaliensis* utilisent l'hydrolysat de caséine; deux seulement (n° 313 et 315) utilisent l'asparagine. Aucun des autres composés n'est utilisé. En présence d'hydrolysat les colonies sont grises, mates (n° 313 et 314) ou incolores (n° 315). Les souches n° 313 et 315 synthétisent un pigment soluble brun qui diffuse dans les milieux où s'observe une croissance. Aucune de ces trois souches ne produit de tyrosinase.

Tableau VIII.

	A									B															
Numéros des souches	Hydrolysat de caséine	Asparagine	Urée	$SO_4(NH_4)_2$	$PO_4H(NH_4)_2$	NO_3NH_4	NO_3K	NO_2Na	Témoin sans N	Acétate de Na	Tartrate de Na	Citrate de Na	l-arabinose	d-xylose	d-glucose	d-lévulose	d-galactose	Saccharose	Maltose	Lactose	Amidon	Mannitol	Glycérol	Témoin sans C	Paraffine
313	7	7	1	0	1	0	0	0	0	0	0	0	0	0	7	0	0	1	7	0	0	0	0	0	0
314	7	1	0	0	0	0	0	0	0	1	0	1	1	1	7	5	1	3	7	3	1		3	1	0
315	7	7	1	0	3	0	0	0	0	0	1	1	3	1	7	3	3	3	7	1	0	1	3	1	0

Utilisation de divers aliments azotés (A) et carbonés (B) par *Streptomyces somaliensis*
La lecture des résultats a été effectuée après un séjour à l'étuve à 30° de 6 semaines (A) et de 7 semaines (B).
0 : pas de croissance, pas d'utilisation
1 : croissance très faible, pas d'utilisation
3 : croissance faible, faible utilisation
5 : croissance et utilisation moyennes
7 : bonne croissance, bonne utilisation

4°) **Utilisation des composés carbonés** (Tableau VIII-B).

La souche n° 314 est cultivée sur un milieu à base d'hydrolysat de caséine comme source d'azote puisqu'elle ne croît qu'en présence de ce seul aliment azoté. Les souches 313 et 315 sont cultivées sur milieu à base d'asparagine. Les résultats mentionnés dans le tableau sont lus après 7 semaines de culture à 30°.

Les trois souches expérimentées, ne peuvent utiliser les sels d'acides organiques. Parmi les sucres, seuls le glucose et le maltose sont bien utilisés; l'utilisation du maltose est à souligner. Les autres sucres sont peu utilisés ou même ne sont pas utilisés. Le glycérol est faiblement utilisé par deux souches.

Sur les milieux où il y a une croissance, le pigment des colonies est blanc plus ou moins teinté de gris.

Discussion

Nous ne ferons pas intervenir dans cette discussion les propriétés des quelques souches qui, notées comme morphologiquement aberrantes dès le début de cette étude, se sont montrées physiologiquement différentes. Elles n'appartiennent vraisemblablement pas aux espèces dans lesquelles elles ont été classées. Ces souches ne figurent pas dans les tableaux IX et X qui récapitulent les divers résultats obtenus dans cette étude.

1°) Morphologie macroscopique.

L'aspect des colonies des différentes souches étudiées est homogène dans les espèces *Streptomyces somaliensis*, *S. pelletieri* et *S. madurae*; il l'est moins dans l'espèce *Nocardia asteroides* et beaucoup moins dans l'espèce *N. brasiliensis*.

2°) Action protéolytique.

L'hydrolyse des protéines est une propriété commune chez les actinomycètes. Ces microorganismes ont fréquemment le pouvoir d'attaquer, par les enzymes qu'ils synthétisent, la gélatine, l'albumine d'oeuf, le lait, la caséine, la fibrine, etc. . . .

L'action protéolytique des diverses souches que nous avons étudiées, est quelquefois difficile à interpréter, notamment lorsque sont utilisés des milieux complexes tels que le lait, le sérum coagulé ou le milieu de Loewenstein. L'utilisation de milieux chimiquement définis, où la protéine est précipitée par action du pH, permet une meilleure interprétation des phénomènes.

Le tableau IX résume les résultats obtenus avec les différentes espèces cultivées en présence des protéines étudiées. Il permet de constater que certains tests, peuvent être utilisables dans le diagnostic d'espèce. Gonzales Ochoa, dès 1945, montrait l'importance de la protéolyse pour la séparation des espèces *N. asteroides* et *N. brasiliensis*. Deux des cinq espèces figurant dans ce travail donnent des résultats homogènes. Les onze souches de *N. asteroides* n'ont aucune action protéolytique et ce, quels que soient les milieux ou les techniques utilisés. A l'opposé, *S. somaliensis* (trois souches seulement ont été expérimentées)

Tableau IX.

	N. asteroides	N. brasiliensis	S. madurae	S. pelletieri	S. somaliensis
Liquéfaction de la gélatine (gélatine peptone en culot)	0/10	10/10	12/13	9/9	3/3
Hydrolyse de la gélatine (milieu selon Frazier) .	0/11	10/10	13/13	9/9	3/3
Liquéfaction du sérum-coagulé	0/11	2/10	7/13	8/9	3/3
Hydrolyse de la sérum-albumine précipitée . .	0/11	6/10	11/13	9/9	3/3
Liquéfaction du milieu de Loewenstein	0/11	1/10	0/13	8/9	3/3
Hydrolyse de l'ovalbumine précipitée	0/11	2/10	1/13	7/7	3/3

Hydrolyse des protéines

Le dénominateur représente le nombre de souches expérimentées, le numérateur représente le nombre de souches ayant permis une hydrolyse.

hydrolyse fortement l'albumine d'oeuf, la sérum-albumine et la gélatine et, là aussi, quels que soient les milieux et techniques employés. Comme *S. somaliensis*, *S. pelletieri* est fortement protéolytique mais une souche, cependant caractéristique (N⁰ 354) ne l'est que faiblement. *S. madurae* hydrolyse les protéines différemment suivant les souches et aussi suivant les techniques utilisées. Il en est de même de l'espèce *N. brasiliensis* qui n'a d'unité que dans l'hydrolyse de la gélatine. La gélatine est en effet hydrolysée par toutes les souches de *Nocardia brasiliensis*. Elle l'est également par toutes les souches de *S. pelletieri* et de *S. somaliensis* et ce, aussi bien avec les techniques classiques (milieu peptone-gélatine en culot), qu'avec la technique de Frazier modifiée utilisant le milieu gélose-gélatine chimiquement défini. Aucune des souches de *N. asteroides* n'hydrolyse la gélatine. Pour *S. madurae* le problème est plus complexe. Douze souches sur treize liquéfient (quelquefois faiblement) la gélatine lorsque l'on emploie la méthode classique. Avec le milieu gélose-gélatine, les treize souches hydrolysent bien la gélatine. L'hydrolyse de la gélatine est, on le sait, liée à plusieurs conditions de milieux (température de culture, composition du milieu qui renferme la gélatine) ainsi d'ailleurs, probablement, à l'âge même de la souche. Waksman (1919) pense que ce n'est qu'un caractère secondaire et c'est vrai pour la grande majorité des actinomycètes. C'est cependant un caractère important pour les actinomycètes aérobies pathogènes, puisqu'il est de ceux qui permettent, par exemple, de séparer l'espèce *N. asteroides* de l'espèce *N. brasiliensis*. Il semble préférable d'utiliser la technique de Frazier (technique que nous avons légèrement modifiée). Il convient de plus, d'attendre d'assez longs délais (un mois minimum) avant d'affirmer que telle souche hydrolyse ou n'hydrolyse pas la gélatine.

Le sérum coagulé de LOEFFLER est également hydrolysé par toutes les souches de l'espèce *S. somaliensis* et inattaqué par *N. asteroides*. Pour les autres espèces, les résultats varient suivant les souches. L'emploi des milieux à la sérum-albumine précipitée (technique selon GIOLITTI) permet d'obtenir des résultats plus corrects. Avec cette dernière technique on met en évidence une hydrolyse par des souches qui ne donnent pas de liquéfaction du sérum coagulé. C'est ainsi que l'on obtient une hydrolyse de la sérum-albumine précipitée par toutes les souches de *S. pelletieri* alors qu'avec le sérum coagulé de LOEFFLER, une souche (n^0 354) ne donnait pas d'hydrolyse. Pour *S. madurae* et *N. brasiliensis*, la technique à l'albumine précipitée, permet également de mettre en évidence l'hydrolyse de la sérum-albumine par des souches qui n'hydrolysent pas le sérum coagulé. D'autres souches cependant n'hydrolysent ni le sérum coagulé ni la sérum-albumine précipitée. L'hydrolyse de la sérum-albumine, positive ou négative suivant les souches, explique que certains auteurs aient décrit l'espèce *S. madurae* comme liquéfiant le sérum-coagulé alors que d'autres la décrivaient comme sans action sur ce milieu.

L'hydrolyse de l'albumine d'oeuf coagulée (milieu de Loewenstein) ou précipitée (milieu selon Giolitti) varie également suivant les espèces et suivant les souches. Le caractère est spécifique pour *N. asteroides* (pas d'hydrolyse), pour *S. pelletieri* et *S. somaliensis* (hydrolyse). Pour *S. madurae* et *N. brasiliensis* l'hydrolyse varie suivant les souches, mais elle est rarement observée.

L'emploi du milieu synthétique à ovalbumine précipitée est à conseiller. Le milieu de Loewenstein contient, en plus de l'albumine d'oeuf, divers ingrédients (notamment de la fécule de pomme de terre) qui peuvent interférer avec le phénomène de liquéfaction du milieu. Cette observation est certainement valable pour des milieux semblables, le milieu de Dorset par exemple.

L'interprétation des résultats obtenus après culture dans du lait écrémé tournesolé, est plus délicate encore que pour les milieux mentionnés ci-dessus. C'est là aussi une explication aux nombreuses contradictions trouvées dans la littérature. L'alcalinisation du lait, se note pour presque toutes les souches des actinomycètes que nous avons étudiés. La coagulation quand elle se présente, est parfois difficile à observer. Elle est en effet fréquemment suivie de la digestion du caillot. Souvent même, coagulation et peptonisation ont lieu ensemble ou bien la peptonisation a lieu sans coagulation préalable.

Les souches de *N. asteroides* ne modifient que très peu l'aspect du lait dans lequel elles se développent. Les souches de *N. brasiliensis* le plus souvent alcalinisent, coagulent et peptonisent le lait; les souches de *S. madurae* le peptonisent parfois; les souches de *S. pelletieri* et de *S. somaliensis* l'alcalinisent et le peptonisent toujours. Là encore, il serait souhaitable d'obtenir des épreuves sur milieux chimiquement définis. Nous avons sans difficulté obtenu un milieu chimiquement défini contenant de la caséine précipitée mais il ne nous est pas encore possible de donner des résultats obtenus avec ce milieu.

3⁰) Utilisation des composés azotés.

En présence de glucose comme source de carbone, l'ordre préférentiel dans lequel les divers composés sont utilisés par les souches expérimentées et retenues comme valables, est le suivant: hydrolysat de caséine $>$ asparagine $>$ $PO_4\,H(NH_4)_2$ $>$ urée $>$ NO_3K $>$ $NO_3\,NH_4$ $>$ $SO_4(NH_4)_2$ $>$ $NO_2\,Na = O$.
La plupart des souches utilisent bien l'hydrolysat de caséine (36 souches sur 39), l'asparagine (38 sur 42), le phosphate d'ammonium (37 sur 39) et l'urée (36 sur 39).
A propos de l'urée il est intéressant de noter que, hormis les trois souches de *S. somaliensis*, tous les actinomycètes pathogènes essayés utilisent bien ce composé. Or, Gottlieb (1953) rapporte que les actinomycètes saprophytes, utilisent mal l'urée: l'uréase ne serait pas fréquemment synthétisée par les actinomycètes. Au contraire, selon Stapp (1953), sur 477 souches du genre *Streptomyces*, 34 seulement, ne peuvent utiliser l'urée.
On s'accorde en général sur le fait que les actinomycètes donnent de faibles développements en présence de sels ammoniacaux bien que, après Krainsky (1914) plusieurs auteurs aient montré qu'ils étaient bien utilisés. Ceci est généralement attribué à une consommation prioritaire de l'ion NH_4 qui accumule dans le milieu un ion NO_3 ou SO_4 par exemple, d'où il découle une acidification importante du substrat. Dans notre étude ou un milieu tamponné est employé, le phosphate d'ammonium est bien utilisé par la grande majorité des souches (deux *S. somaliensis* n'utilisent pas ce composé et une l'utilise mal). On constate même que pour les divers *S. madurae*, $PO_4\,H(NH_4)_2$ permet un développement meilleur que celui donné par l'hydrolysat de caséine ou l'asparagine. Les deux autres sels d'ammonium, $NO_3\,NH_4$ et $SO_4\,(NH_4)_2$ ne sont pas utilisés par *S. pelletieri* ni par *S. somaliensis*; ils sont mal utilisés par *S. madurae*; moyennement utilisés par *N. asteroides*. Ils sont en revanche bien utilisés par *N. brasiliensis* qui, là aussi, se singularise.
Les nitrates sont en général bien utilisés par les actinomycètes, en présence de sources convenables de carbone. Parmi les germes pathogènes que nous avons étudiés, *N. asteroides*

TABLEAU X.

	Utilisation des composés									
	N. asteroides		N. brasiliensis		S. madurae		S. pelletieri		S. somaliensis	
	Degré moyen *	Nbre de souches**	Degré moyen	Nbre de souches	Degré moyen	Nbre de souches	Degré moyen	Nbre de souches	Degré moyen	Nbre de souches
Hydrolysat de caséine	7	9/9	7	8/8	5	9/12	5	7/7	7	3/3
Asparagine	7	10/10	7	10/10	5	9/12	5	7/7	5	2/3
Urée	7	9/9	7	8/8	5	12/12	5	7/7	1	0/3
$SO_4 (NH_4)_2$	5	8/10	5	10/10	3	6/12	0	0/7	0	0/3
$PO_4H(NH_4)_2$	7	9/9	7	8/8	7	12/12	5	7/7	1	1/3
$NO_3 NH_4$	5	9/10	5	10/10	3	8/12	0	0/7	0	0/3
$NO_3 K$	5	9/9	7	8/8	3	9/12	0	0/7	0	0/3
$NO_2 Na$	0	0/9	0	0/8	0	0/12	0	0/7	0	0/3
Témoin sans N	0	0/10	0	0/10	1	0/12	0	0/7	0	0/3
Acétate de Na	0	1/10	1	5/8	3	10/13	3	6/6	0	0/3
Tartrate de Na	0	0/10	1	4/8	0	0/13	0	0/7	0	0/3
Citrate de Na	0	0/10	1	4/8	3	7/13	0	0/7	1	0/3
l. arabinose	0	0/10	3	6/8	1	5/13	0	0/7	1	1/3
d. xylose	0	0/10	3	5/8	5	12/13	0	0/7	1	0/3
d. glucose	7	11/11	7	10/10	7	13/13	7	7/7	7	3/3
d. levulose	7	10/11	7	10/10	5	13/13	3	5/7	3	2/3
d. galactose	0	0/11	7	10/10	3	8/13	0	0/7	1	1/3
Saccharose	0	0/10	3	6/8	3	10/13	1	3/7	1	2/3
Maltose	1	1/10	3	6/8	3	10/13	0	0/7	7	3/3
Lactose	0	0/10	1	3/8	3	7/13	0	0/7	1	1/3
Amidon	0	1/10	3	4/8	5	13/13	0	0/7	0	0/3
Mannitol	5	5/11	7	10/10	5	13/13	0	0/7	0	0/2
Glycérol	5	8/11	7	10/10	5	13/13	1	2/7	1	2/3
Témoin sans C	0	0/11	0	0/10	0	0/13	0	0/7	1	0/3
Paraffine	5	11/11	5	10/10	0	0/13	0	0/7	0	0/3

Récapitulation des résultats portant sur l'utilisation des composés azotés et carbonés par les cinq espèces étudiées.

*) Degré *moyen* d'utilisation: 0 : pas d'utilisation
1 : pas d'utilisation probable
3 : faible utilisation
5 : utilisation moyenne
7 : bonne utilisation

**) En dénominateur: nombre de souches expérimentées
En numérateur: nombre de souches ayant fourni une croissance sur le composé considéré.

et *N. brasiliensis* (en présence de glucose) utilisent bien ou moyennement les deux nitrates expérimentés (NO_3 K et NO_3 NH_4). *S. madurae* les utilise mal et les deux autres *Streptomyces* ne les utilisent pas.

Afin de savoir si les nitrates ou les sels d'ammonium ne permettant pas de croissance sont simplement non utilisés ou bien si ils ont une action toxique, nous avons cultivé quelques souches témoins de *S. madurae* (n° 306, 307 et 332) et de *S. pelletieri* (n° 308 et 309) sur un milieu synthétique glucosé, contenant, soit de l'hydrolysat de caséine seul, soit de l'hydrolysat additionné de NO_3K, de NO_3 NH_4 ou de SO_4 $(NH_4)_2$. Nous avons observé pour les cinq souches: 1°) une bonne croissance dans les milieux contenant l'hydrolysat seul et l'hydrolysat + SO_4 $(NH_4)_2$; 2°) une croissance faible ou nulle dans les milieux contenant l'hydrolysat + un des nitrates. Les nitrates font preuve dans ce cas, d'une certaine toxicité puisqu'ils réduisent ou empêchent la croissance que permet le seul hydrolysat. Une éventuelle acidification de notre milieu tamponné pourrait être retenue comme responsable. Mais, cette modification du pH, si elle avait eu lieu, aurait dû être également sensible avec le SO_4 $(NH_4)_2$. Il reste donc à envisager une action toxique possible des nitrites libérés par réduction des nitrates.

La plupart des actinomycètes sont capables de réduire plus ou moins les nitrates en nitrites. C'est le cas des espèces pathogènes. Par ailleurs, les actinomycètes sont sensibles à l'action toxique des nitrites, laquelle action varie suivant les souches, les concentrations et la qualité de la source de carbone. WAKSMAN (1920) à observé que le NO_2Na employé à une faible concentration (0,05 %) est une bonne source d'azote à condition que l'aliment carboné soit du glycérol. En présence de glucose, le nitrite est mal utilisé. On peut penser que le nitrite produit par réduction du nitrate, suffit à bloquer ou à ralentir la croissance des germes. Dans nos expériences, le nitrite de sodium est toujours toxique mais la concentration est élevée (cinq fois supérieure à celle employée par WAKSMAN) et par ailleurs, l'aliment carboné de notre milieu de base est du glucose, composé impropre à une bonne utilisation du nitrite.

4°) Utilisation des composés carbonés.

Les actinomycètes peuvent éventuellement utiliser le carbone de composés complexes. Nous avons observé que certaines protéines ou certains composés organiques (hydrolysat de caséine, asparagine) peuvent, dans certains cas, fournir le carbone utile à la croissance. Pour l'étude de la nutrition carbonée il importe, donc de n'employer dans les milieux de base que des composés azotés non utilisés comme source de carbone.

Les études portant sur de nombreuses espèces différentes mais représentées seulement dans les expériences par une ou deux souches, donnent des résultats plus hétérogènes que ceux (déjà assez peu homogènes) obtenus par des études portant sur de nombreuses souches d'une même espèce. WAKSMAN (1919), dans une étude comportant de nombreuses espèces différentes, à obtenu l'ordre suivant d'utilisation préférentielle des composés carbonés: amidon > glucose > lactose > maltose > glycérol > mannite > saccharose > lactate de sodium > arabinose > acétate de sodium > malate de sodium, > tartrate de sodium > oxalate de sodium.

Pour les diverses souches des cinq espèces que nous avons étudiées, l'ordre suivant est établi: glucose > glycérol > lévulose > mannitol > maltose > galactose > xylose > amidon > saccharose > acétate de sodium > arabinose > lactose > citrate de Na > tartrate de Na. Du saccharose au tartrate, les composés mentionnés ne sont que peu utilisés ou ne sont pas utilisés.

Pour chaque espèce l'ordre préférentiel d'utilisation est rapporté dans la conclusion.

L'acétate de Na est le mieux utilisé des trois sels d'acides organiques mais il l'est faiblement. Il est utilisé par les espèces *S. madurae* (onze souches sur quinze) et *S. pelletieri* (six souches sur sept). Le citrate est faiblement utilisé par sept souches de *S. madurae* et le tartrate n'est pratiquement pas utilisé.

Deux alcools ont été expérimentés, le mannitol et le glycérol. Ils sont tous deux bien utilisés par *N. asteroides*, *N. brasiliensis* et *S. madurae.* Le mannitol n'est pas utilisé par *S. pelletieri* et *S. somaliensis* et le glycérol l'est mal. La non utilisation du mannitol distingue ces deux dernières espèces des trois citées plus haut.

Les deux pentoses sont mal utilisés ou ne le sont pas. L'arabinose n'est utilisé, le plus souvent mal, que par quelques souches de *N. brasiliensis* (6 sur 8), de *S. madurae* (7 sur 13) et par une souche de *S. somaliensis.* Le xylose est faiblement utilisé par quelques souches de *N. brasiliensis*; il est plus intéressant de noter qu'il est bien utilisé par 12 souches sur 13 de l'espèce *S. madurae.*

Parmi les hexoses, le glucose est particulièrement bien utilisé par toutes les souches figurant dans notre étude. Le l-lévulose est également utilisé par la quasi totalité des souches (40 sur 44) mais moins bien par les espèces *S. pelletieri* et *S. somaliensis.* Le galactose qui, d'après la littérature, est généralement bien utilisé par les actinomycètes est au contraire un médiocre aliment carboné pour les souches que nous avons étudiées. Toutes les souches de *N. brasiliensis* se développent en présence de ce sucre. Il est pour cette dernière espèce un bon aliment et ce caractère permet de séparer *N. brasiliensis* de l'espèce *N. asteroides* qui n'utilise pas le galactose. Une souche de *S. somaliensis*, 8 souches de *S. madurae* sur 13 donnent une croissance avec le galactose.

Les disaccharides (et en particulier le saccharose) sont, de façon générale, mal utilisés par les actinomycètes. Ce fait se vérifie avec les espèces pathogènes étudiées.

Le saccharose et le maltose sont faiblement utilisés par la plupart des souches de *N. brasiliensis* et de *S. madurae*. Les trois souches de *S. somaliensis* utilisent bien le maltose. Pour le maltose et le saccharose, la faible utilisation ou la non utilisation est certainement dûe à la faible synthèse ou à l'absence de synthèse des enzymes hydrolytiques correspondants. Les oses qui les composent sont en effet généralement bien utilisés. Cette hypothèse vaut probablement aussi pour le lactose où cependant, l'un des constituants est, lui, généralement mal utilisé.

L'amidon qui, d'après la littérature, est bien utilisé par les actinomycètes en général est, dans l'ensemble, une mauvaise source de carbone pour les espèces pathogènes étudiées dans ce mémoire. Cependant toutes les souches de *S. madurae* utilisent bien l'amidon. Ce caractère qui est confirmé par la réaction iodo-iodurée peut avoir une valeur taxonomique. Mise à part cette espèce, seules quelques souches (4 sur 8) de *N. brasiliensis*, donnent une faible croissance en présence de ce polyoside. Les autres espèces n'utilisent pratiquement pas l'amidon. A ce propos, il faut noter que, selon MACKINNON & ARTAGAVEYTIA-ALLENDE (1956), *S. somaliensis* hydrolyse l'amidon. Nous n'avons pas mis en évidence cette propriété avec les trois souches que nous avons étudiées. Aucune croissance de ces souches n'a été obtenue en présence d'amidon et la réaction iodo-iodurée effectuée après 3, 4 et 6 semaines d'incubation, n'a montré aucune hydrolyse.

Il est vraisemblable que les enzymes hydrolysant l'amidon en sucres assimilables font défaut aux souches incapables de l'utiliser. Il est intéressant de noter que les travaux réalisés avec des espèces saprophytes, montrent, selon GOTTLIEB (1953) que les polyosides contenant du glucose (amidon et dextrine) sont utilisés par toutes les espèces de *Streptomyces* expérimentées.

Nous n'avons fait aucune mention dans nos tableaux de l'action sur la cellulose. La culture sur papier filtre imbibé de solution nutritive chimiquement définie n'a, dans aucun cas, permis de croissance; aucune destruction de la cellulose n'a été observée.

La croissance en présence de paraffine comme unique aliment carboné ne s'observe qu'avec les seules souches des espèces *N. asteroides* et *N. brasiliensis*.

Certains des caractères mis en évidence par les expériences rapportées dans ce mémoire, peuvent être utilisés pour la détermination spécifique des actinomycètes aérobies pathogènes. Ces caractères physiologiques spécifiques qui se trouvent résumés dans le tableau XI et dans la conclusion, peuvent utilement compléter les caractères morphologiques. Rappelons que, dans le cas de mycétomes, la couleur du grain *in vivo*, sa forme sur coupe anatomique et les caractéristiques réactionnelles des lésions histologiques, sont également d'une grande aide dans le diagnostic spécifique de ces actinomycètes (Camain et col, 1957; Mariat 1957).

Tableau XI.

	N. asteroides	N. brasiliensis	S. madurae	S. pelletieri	S. somaliensis
Hydrolyse de la gélatine (1)	0	+	+	+	+
Hydrolyse de la sérum albumine (2)	0	+ ou 0	+ ou 0	+	+
Hydrolyse de l'ovalbumine (2)	0	+ ou 0	0	+	+
Utilisation de:					
urée (3)	+	+	+	+	0
$SO_4(NH_4)_2$	+	+	+ ou 0	0	0
NO_3K	+	+	+ ou 0	0	0
Utilisation de:					
d. xylose	0	+ ou 0	+	0	0
d. galactose	0	+	+ ou 0	0	+ ou 0
maltose	0	+ ou 0	+ ou 0	0	+
amidon	0	+ ou 0	+	0	0
mannitol	+ ou 0	+	+	0	0
paraffine	+	+	0	0	0

Tableau groupant les caractères utilisables pour la détermination des espèces mentionnées.

Ces caractères ont été déterminés dans les conditions des expériences rapportées dans ce mémoire à savoire:

(1) culture sur milieu gélose-gélatine (selon Frazier et Gordon)
(2) hydrolyse des protéines précipitées en milieu chimiquement défini (selon Giolitti)
(3) utilisation des composés en milieu chimiquement défini.

Les divers caractères morphologiques et physiologiques ainsi obtenus, permettent d'affirmer que les cinq espèces étudiées dans ce mémoire sont de bonnes espèces alors qu'au contraire d'autres, comme *S. africanus* ne sont pas valables. Dans chacune de ces espèces, les souches diffèrent les unes des autres par des caractères morphologiques ou physiologiques plus ou moins nombreux et importants. Ces caractères que nous dirons secondaires, ne peuvent à eux seuls, suffire à justifier des espèces distinctes, ni même des variétés telles que les conçoivent Burkholder et al (1954). Il est toutefois souhaitable que de nouveaux essais portant sur d'autres souches que celles que nous avons étudiées, viennent confirmer ou au contraire infirmer, la valeur de tel caractère reconnu comme spécifique. Il convient donc de grouper au sein de ces cinq espèces, tous les actinomycètes aérobies pathogènes décrits ou à décrire qui possèdent „en gros" les mêmes caractères, sans s'arrêter à un caractère secondaire pour créer une espèce nouvelle comme le fait s'est hélas trop souvent produit dans le passé. Ceci ne signifie toutefois pas qu'il ne peut exister d'autres espèces valables. Il est simplement recommandé de vérifier qu'elles ne peuvent être rattachées à une des espèces décrites ci-dessus et de vérifier qu'elles constituent bien des entités distinctes.

Résumé et Conclusions

1°) Le pouvoir protéolytique, la nutrition carbonée et la nutrition azotée de 52 souches appartenant à 5 espèces d'actinomycètes aérobies pathogènes ont été étudiés. Ces 5 espèces sont *Nocardia asteroides* (12 souches), *Nocardia brasiliensis* (12 souches), *Streptomyces madurae* (15 souches), *Streptomyces pelletieri* (10 souches) et *Streptomyces somaliensis* (3 souches).

2°) Quelques rares souches sont reconnues comme ne pouvant appartenir aux espèces considérées dans lesquelles elles ont été classées par erreur. Ces souches aberrantes (une souche de *N. asteroides*, deux de *N. brasiliensis*, deux de *S. madurae* et une de *S. pelletieri*) ne sont pas prises en considération pour les conclusions mentionnées ci-dessous.

3°) La morphologie macroscopique de chaque espèce sur milieu de routine (gélose Sabouraud glucosée, gélose au bouillon de viande, gélose pomme de terre glycérinée, sérum coagulé glucosé et milieu de Loewenstein-Jensen) est rappelée. La morphologie macroscopique de trois espèces présente une certaine unité (*S. madurae*, *S. pelletieri* et *S. somaliensis*); celle des deux autres est plus hétérogène dans la forme ou la couleur des colonies (*N. asteroides* et surtout *N. brasiliensis*).

4°) Le pouvoir protéolytique des souches est recherché: a) sur milieux classiques (gélatine peptone selon WAKSMAN — sérum coagulé de Loeffler — milieu de Loewenstein — lait tournesolé); b) sur milieux chimiquement définis (milieux gélatine, gélose selon FRAZIER modifié — milieux à la sérum-albumine ou à l'ovalbumine précipitée selon GIOLITTI). Les milieux chimiquement définis permettent d'obtenir des résultats plus constants et plus nets. Leur emploi est recommandé. Le pouvoir protéolytique des espèces étudiées est variable: quelques uns des caractères sont spécifiques. Il est intéressant de souligner que l'espèce *N. asteroides* ne possède aucun pouvoir protéolytique décelable.

5⁰) L'utilisation de trois composés azotés organiques et de cinq composés azotés minéraux est recherchée dans un milieu chimiquement défini (source de carbone: glucose). Les trois composés organiques (hydrolysat de caséine, asparagine et urée) sont généralement bien utilisés. Parmi les composés minéraux le phosphate d'ammonium est bien utilisé. Les autres sels sont plus ou moins bien utilisés suivant les espèces. Ils sont le plus souvent, inférieurs aux précédents. Dans les conditions des expériences, le nitrite de sodium est toxique.

6⁰) Les divers composés azotés sont utilisés par chaque espèce suivant les progressions moyennes rapportées ci-dessous.
N. asteroides: Asparagine > urée > hydrolysat de caséine $> PO_4H(NH_4)_2 > NO_3K > NO_3NH_4 > SO_4(NH_4)_2 > NO_2Na$; ce dernier composé n'étant pas utilisé.
N. brasiliensis: Hydrolysat de caséine $> PO_4H(NH_4)_2 > NO_3K >$ asparagine > urée $> SO_4(NH_4)_2 > NO_3NH_4 > NO_2Na$ qui n'est pas utilisé.
S. madurae: $PO_4H(NH_4)_2 >$ urée > asparagine > hydrolysat de caséine $> NO_3K > NO_3NH_4 > SO_4(NH_4)_2 > NO_2Na$ qui n'est pas utilisé.
S. pelletieri: Urée = asparagine = hydrolysat de caséine = $PO_4H(NH_4)_2$. Les autres composés ne sont pas utilisés.
S. somaliensis: Hydrolysat de caséine > asparagine. Les autres composés ne sont pas utilisés.

7⁰) L'utilisation de quinze composés carbonés est recherchée en milieu chimiquement défini. Le glucose est bien utilisé par la totalité des souches expérimentées. Le lévulose par la presque totalité. Les autres composés sont utilisés de façon variable suivant les espèces ou suivant les souches. La paraffine est utilisée comme unique aliment carboné par toutes les souches de *N. asteroides* et de *N. brasiliensis.* Elle n'est pas utilisée par les autres espèces.

8⁰) Les différents composés carbonés sont utilisés par chaque espèce suivant les progressions moyennes rapportées ci-après.

9⁰) *N. asteroides:* glucose > lévulose > glycérol > mannitol > les autres composés qui ne sont pratiquement pas utilisés.
N. brasiliensis: glycérol > glucose > lévulose > galactose > mannitol > xylose > arabinose > saccharose > maltose > les autres composés pratiquement non utilisés.
S. madurae: glucose > glycérol > amidon > xylose > mannitol > lévulose > saccharose > galactose > maltose > acétate de Na > lactose > citrate de Na > les autres composés qui sont non utilisés.
S. pelletieri: glucose > lévulose > acétate de Na > les autres composés étudiés qui ne sont pas utilisés.
S. somaliensis: glucose > maltose > lévulose > les autres composés qui ne sont pas utilisés.

10⁰) Dans les conditions de nos expériences, les propriétés suivantes peuvent être retenues (tableau XI) comme spécifiques:
N. asteroides: pouvoir protéolytique nul; utilisation de l'urée, du $SO_4(NH_4)_2$, et de NO_3K comme sources d'azote; non utilisation du galactose, du xylose, du maltose et de l'amidon comme sources de carbone mais utilisation de la paraffine.
N. brasiliensis: hydrolyse de la gélatine, utilisation de l'urée, du $SO_4(NH_4)_2$ et du NO_3K comme aliments azotés; utilisation du galactose, du mannitol et de la paraffine comme aliments carbonés. Ces caractères font de *N. brasiliensis* une espèce tout à fait valable et bien distincte de *N. asteroides* avec laquelle certains la confondent.
S. madurae: hydrolyse la gélatine mais n'hydrolyse pas l'ovalbumine; utilise bien l'urée comme aliment azoté; le xylose, le manitol et l'amidon sont utilisés comme aliments carbonés; la paraffine n'est pas utilisée.
S. pelletieri: hydrolyse la gélatine, la sérum-albumine et l'ovalbumine; utilise l'urée comme source d'azote mais n'utilise pas le $SO_4(NH_4)_2$ ni le NO_3K; n'utilise comme source de carbone, ni le xylose ni le galactose, ni le maltose, ni l'amidon, ni le mannitol, ni la paraffine. Les souches décrites dans l'espèce *S. africanus* ne diffèrent en rien des souches de l'espèce *S. pelletieri*. Ces deux espèces sont synonymes.
S. somaliensis: hydrolyse la gélatine, la sérum-albumine et l'ovalbumine; n'utilise comme source d'azote, ni l'urée, ni le $SO_4(NH_4)_2$, ni le NO_3K; comme aliment carboné, utilise le maltose mais n'utilise pas le xylose, l'amidon, le mannitol ni la paraffine.

Summary and Conclusions

1⁰) The proteolytic activity, the nitrogen and carbon nutrition of 52 strains belonging to 5 species of pathogenic aerobic actinomycetes have been studied. These 5 species were *Nocardia asteroides* (12 strains), *N. brasiliensis* (12 strains), *Streptomyces madurae* (15 strains), *S. pelletieri* (10 strains) and *S. somaliensis* (3 strains).

2⁰) A few strains do not belong to the species referred to in which they have been classified by error. These strains (one for *N. asteroides*, two for *N. brasiliensis*, two for *S. madurae*, one for *S. pelletieri*) are not taken into consideration for the conclusions mentioned hereafter.

3⁰) The macroscopical morphology of each species on routine media (Sabouraud dextrose agar, broth agar, potato glycerol agar, inspissated dextrose serum, Loewenstein-Jensen medium) has been mentioned. This morphology was fairly homogenous for *S. madurae*, *S. pelletieri* and *S. somaliensis*, but more heterogenous for *N. asteroides* and *N. brasiliensis*.

4⁰) The proteolytic activity has been studied on a) Routine media (peptone-gelatin after WAKSMAN, inspissated dextrose serum, Loewenstein-Jensen medium, litmus milk); b) Chemically defined media (gelatin-agar, after FRAZIER, modified; media containing precipitated egg albumin or serum albumin, after GIOLITTI). These chemically defined media have given more constant and clearer results. Their use must be recommended. The proteolytic activity of the species studied is variable. Some characteristics are specific.

5⁰) The utilization of three organic nitrogen compounds and five inorganic ones has been tested on a synthetic, chemically defined medium (carbon source: dextrose). The organic compounds (casein hydrolysat, asparagin, urea) were generaly well utilized. Among the inorganic compounds, $PO_4H(NH_4)_2$ was well utilized. The other nitrogen salts were more or less utilized. In our experiments, NO_2Na was toxic.

6⁰) For each species, the nitrogen compounds were utilized as follow:
N. asteroides: Asparagin > urea > casein hydrolysat > $PO_4H(NH_4)_2$ > NO_3K > NO_3NH_4 > $SO_4(NH_4)_2$ > NO_2Na; the last compound was not utilized.
N. brasiliensis: Casein hydrolysat > $PO_4H(NH_4)_2$ > NO_3K > asparagin > urea > $SO_4(NH_4)_2$ > NO_3NH_4 > NO_2Na which was not utilized.
S. madurae: $PO_4H(NH_4)_2$ > urea > asparagin > casein hydrolysat > NO_3K > NO_3NH_4 > $SO_4(NH_4)_2$ > NO_2Na which was not utilized.
S. pelletieri: Urea = asparagin = casein hydrolysat = $PO_4H(NH_4)_2$. The other compounds were not utilized.
S. somaliensis: Casein hydrolysat > asparagin. The other compounds were not utilized.

7⁰) The utilization of fifteen carbon compounds has been tested on synthetic media. Dextrose was well utilized by all the strains studied. Fructose was utilized by almost all the strains. The other C compounds were more or less utilized according to species and strains. Paraffin was utilized as the sole source of carbon by all the strains of *N. asteroides* and *N. brasiliensis*. It was not utilized by the other species.

8⁰) For each species, the carbon compounds were utilized as follow:
N. asteroides: Dextrose > fructose > glycerol > mannitol > the other carbon compounds which were practically not utilized.
N. brasiliensis: Glycerol > dextrose > fructose > galactose > mannitol > xylose > arabinose > saccharose > maltose > the other compounds which were practically not utilized.
S. madurae: Dextrose > glycerol > starch > xylose > man-

nitol $>$ fructose $>$ saccharose $>$ galactose $>$ maltose $>$ Na acetate $>$ lactose $>$ Na citrate $>$ the other compounds tested which were not utilized.

S. pelletieri: Dextrose $>$ fructose $>$ Na acetate $>$ the other compounds tested which were not utilized.

S. somaliensis: Dextrose $>$ maltose $>$ fructose $>$ the other compounds tested which were not utilized.

10⁰) In the conditions of our experiments the following species characteristics may be recognized (table XI):

N. asteroides: no proteolytic activity; utilization of urea, $SO_4(NH_4)_2$ and NO_3K as sources of nitrogen; no utilization of galactose, xylose, maltose and starch as carbon sources but utilization of paraffin.

N. brasiliensis: gelatin hydrolysis; utilization of urea, $SO_4(NH_4)_2$ and NO_3K as nitrogen sources; utilization of galactose, mannitol and paraffin as carbon sources. These characteristics show that *N. brasiliensis* is a good species clearly distinguished from *N. asteroides.*

S. madurae: Hydrolysis of gelatin; no hydrolysis of egg albumin; utilization of urea as nitrogen source; xylose, mannitol and starch utilized as carbon sources; paraffin was not utilized.

S. pelletieri: hydrolysis of gelatin, serum albumin and egg albumin; utilization of urea but no utilization of $SO_4(NH_4)_2$ and NO_3K as nitrogen sources; no utilization of xylose, galactose, maltose, starch, mannitol and paraffin as carbon sources. The species *S. africanus* is indistinguishable from *S. pelletieri.*

S. somaliensis: hydrolysis of gelatin, serum albumin and egg albumin; no utilization of urea, $SO_4(NH_4)_2$ and NO_3K as nitrogen sources; utilization of maltose, but no utilization of xylose, starch, mannitol and paraffin as carbon sources.

Références

Almeida, F. de & Lacaz, C. S. (1941), Estudio sobre o *Actinomyces brasiliensis,* Lindenberg, An. Fac. med. Univ. Sao Paulo, **17,** 577—583.

Baldacci, E. (1944), Contributo alla sistematica degli Attinomiceti. X: *Actinomyces madurae.* Atti Ist. Bot., Pavia, 3ème série **V,** 141—151.

Benedict, R. G., Pridham, P. G., Lindenfelser, L. A., Hall, H. H., & Jakson, R. W. (1955), Further studies in the evaluation of carbohydrate utilization tests as aids in the differenciation of species of Streptomyces. Appl. Microbiol., **3,** 1—6.

Brion, S., Guiot, G. & Delaveau, P. (1955), Actinomycose du système nerveux central due à *Nocaria asteroides.* Sem. Hopitaux, Paris, P & B, **31,** 2889—2904.

Burkholder, P. R., Sung Huang Sun, Erlich, J. & Anderson, L. (1954), Criteria of speciation in the genus *Streptomyces.* Ann. New York Acad. Sci., **60,** 102—123.

Camain, R., Segretain, G., & Nazimoff, O. (1957), Etude histopathologique des mycétomes du Sénégal. Sem. Hopitaux, Paris, P & B, **33,** 923—938.

Giolitti, G. (1955), Terreni per lo studio del potere proteolitico degli Attinomiceti. Atti Soc. ital. Sci. Vet., **9,** 649—651.

Giolitti, G. & Lugli, A. M. (1956), Nitrogen metabolism in antibiotic producing actinomycetes. Giorn. Microbiol., **2,** 325—350.

Catanei, A. (1942), Sur des changements de caractères culturaux de *Nocardia madurae;* étude morphologique et expérimentale. Arch. Inst. Pasteur Algérie, **20** 299—304.

Frazier, W. C. (1926), A method for the detection of changes in gelatin due to bacteria. J. Infect. Dis., **39,** 302—309.

Gonzales Ochoa, A. (1945), Estudio comparativo entre *Actinomyces mexicanus, A. brasiliensis* y *A. asteroides.* Rev. Inst. Salubr. *Enf.* Trop., **6,** 155—162.

Gonzales Ochoa, A. & Los Angeles Sandoval, M. de (1955), Caracteristicas de los Actinomicetes patogenos mas comunes. Rev. Inst. Salubr. Enf. Trop., **15,** 149—161.

Gonzales Ochoa, A. & Los Angeles Sandoval, M. de (1956), Revision determinativa de algunas especies de actinomicetes patogenos descritas como differentes. Rev. Inst. Salubr. Enf. Trop., **16,** 17—25.

Gordon, R. E. & Mihm, J. M. (1957), A comparative study of some strains received as *Nocardiae.* J. Bacteriol., **73,** 15—27.

Gottlieb, D. (1953), The physiology of the Actinomycetes. Congrès International de Microbiologie, Rome, 1953. Symposium sur les Actinomycétales.

Hesseltine, C. W., Benedict, R. G. et Pridham, T. G. (1954), Usefull criteria for species differenciation in the genus *Streptomyces.* Ann. New York Acad. Sci., **60,** 136—151.

Krainsky, A. (1914), Die Aktinomyceten und ihre Bedeutung in der Natur. Centralbl. Bakt. II Abt., **41,** 649—688.

Lacaz, C. S. (1945), Contribuiçao para o estudo dos actinomycetos produtores de micetomas. Thèse, Sao Paulo.

McClung, N. M. (1954), The utilization of carbon compounds by *Nocardia* species. J. Bact., **68,** 231—236.

Mackinnon, J. E. & Artagaveytia-Allende, R. C. (1956), The main species of pathogenic actinomycetes causing mycetomas. Trans. Roy. Soc. Trop. med. Hyg., **50,** 31—40.

Mariat, F. (1954), Physiologie des Actinomycètes aérobies pathogènes I: Expériences préliminaires. Ann. Inst. Pasteur, **86,** 479—484.

Mariat, F. (1957), Sur le diagnostic mycologique des principales mycoses du système nerveux central. Sem. Hopitaux, Paris, P & B, **33,** 901—912.

Mariat, F. (1957), Les principaux actinomycètes aérobies responsables de mycétomes. Sem. Hopitaux, Paris, P & B, **33,** 939—949.

Mariat, F. (1957), Sur l'utilisation de divers composés carbonés et azotés par *Streptomyces madurae, S. pelletieri* et *S. somaliensis.* C. R. Acad. Sci., **245,** 593—596.

Mariat, F., Hazen, E. L., Le Beau, J. & Testard, e. (1955), Nocardiose humaine à abcès cérébraux multiples: étude bactériologique. Ann. Inst. Pasteur, **89,** 256—260.

Mariat, F. & Lavalle, P. (1955), Sur l'utilisation de divers composés carbonés et azotés par *Nocardia asteroides* et *N. brasiliensis.* C. R. Acad. Sci., **240,** 255—257.

Ohki, N. (1953), Taxonomic studies on Streptomyces (I) Classification by the utilization of carbon compounds. Kitasato Arch. Exp. Med., **25,** 209—221.

Perlman, D. (1953), Physiological studies on the Actinomycetes. Bot. Rev. **19,** 46—97.

Perlman, D. & O'Brien, E. (1956), Utilization of carbohydrates by strains of *Streptomyces griseus.* J. Bact., **72,** 214—218.

Pridham, T. G. & Gottlieb, D. (1948), The utilization of carbon compounds by some actinomycetales as an aid for species determination. J. Bact., **56,** 107—114.

Stapp, C. (1953), Untersuchungen über Aktinomyzeten des Bodens. I Mitteilung. Centralbl. Bakt. II Abt., **107,** 129—150.

Testard, E., Mariat, F., Gaches, J. & Le Beau, J., Abcès cérébraux multiples dus à une espèce inhabituelle de *Nocardia.* Rev. Neurol., **91,** 92—101.

Vanbreuseghem, R., Courtois, C., Thys, A. & Doupagne, P. (1956), Deux cas de mycétomes congolais par *Nocardia brasiliensis.* Ann. Soc. Belge Med. Trop., **36,** 479—486.

Waksman, S. A. (1918), Studies in the metabolism of pathogenic actinomycetes. J. Infect. Dis., **23,** 547—554.

WAKSMAN, S. A. (1919), Studies in the metabolism of Actinomycetes. J. Bact., **4,** 189—216 et 307—330.

WAKSMAN, S. A. (1920), Studies in the metabolism of Actinomycetes. III. Nitrogen metabolism. J. Bact., **5,** 1—30.

WAKSMAN, S. A. (1950), The Actinomycetes. Chronica Botanica et Cie, Waltham,

WAKSMAN, S. A. (1957), Species conceipt among the Actinomycetes with special reference to the genus *Streptomyces*. Bacteriol. Rev., **21,** 1—29.

A NEW SPECIES OF ERYSIPHE

T. S. Viswanathan

(*Department of Mycology and Plant Pathology Maharashtra Association for the Cultivation of Science Laboratory, Poona* 4, *India*)

(3.XII.1957)

A powdery mildew caused by a species of *Erysiphe* was collected by the writer at Matheran (Bombay), during the cold season of 1956 parasitizing *Leucas stelligera* Wall. The mildew produced profuse white patches on both sides of the leaves with numerous black cleistothecia mainly on the lower sides. Since the host, *Leucas stelligera* Wall has not been previously reported for this fungus genus, a detailed study was made of the mildew, the results of which are presented below.

Of the three sections in which the fungus genus *Erysiphe* has been divided by Homma[1]), the fungus under study falls in the *Cichoracearum* section and has similarities with *Erysiphe galeopsidis* Dc. described on *Geranium erianthum* Dc. and other hosts of *Labiatae* in the character of not maturing the ascospores on the living host. A comparison between *Erysiphe galeopsidis* and the Matheran mildew is presented in Table 1.

Table 1.

Fungus	Conidia Size & Nature	Cleistothecia diameter	Appendages	Asci dimensions	Ascospores
E. galeopsidis	Ellipsoid 26.4—37.2 X 12.8—20.4 μ	112—161 μ	long 17—31	45.6—72.0 X 21.6—34.8 μ	Immature on living host. Two after a year.
Matheran mildew	Barrel shaped 23—47 X 13.5—19.5 μ	97.5—172 μ	Medium Numerous	39.0—43.0 X 19.5—27.3 μ	Immature on living host.

It is evident from a study of the above table that the Matheran mildew is distinct from *E. galeopsidis* Dc. in the shape of conidia, which are typically barrel-shaped, the smaller dimensions of asci and the number and length of the appendages on the body of the Cleistothecia. Besides the mildew genus has not been previously reported on *Leucas stelligera* WALL. The Matheran fungus is, therefore, described as a new species of *Erysiphe* with Latin diagnosis:

---

[1]) Homma, Yasu, (1937) Erysiphaceae of Japan; J. Facul. Agril. Hokkaido Imp. Univ. Sapporo, Japan.

Erysiphe matheranensis VISWANATHAN spec. nov.

Mycelium ectophyticum, densum, permanens, ornatum haustoriis sub-globularibus; conidia catenulata, doliiformia, 23.4—46.8 X 13.7—19.5 μ. Cleistothecia gregaria vel dispersa, fusce brunnea, globularia, 97.5—171.6 μ diam.; appendices plures, brunneae, hyphoideae, septatae, longitudine media, simplices; asci 10—12, pyriformes, pedicellati, 39—43 X 19.5—27.4 μ; ascosporae immaturae in hospite vivente.

Typus lectus in foliis et ramulis *Leucadis stelligerae* DC. in loco Matheran, in India a T. S. VISWANATHAN.

The author is grateful to Prof. M. N. KAMAT for guidance and Rev. Father H. SANTAPAU for Latin diagnosis.

Type specimens have been deposited at the Commonwealth Mycological Institute, Kew, England, and Herbarium Orientalis, New Delhi (India).

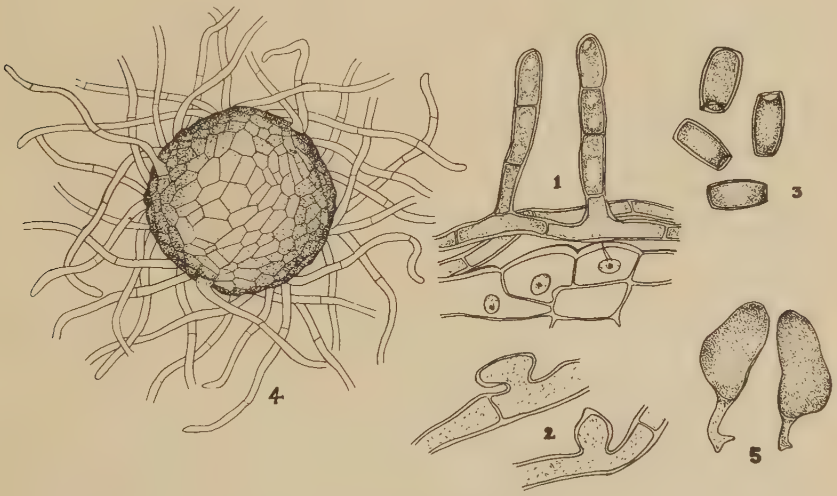


Fig. 1. Ectophytic mycelium with conidiophores and haustoria (X 420).

Fig. 2. Appressoria (X 975).

Fig. 3. Oidia (X 420).

Fig. 4. Cleistothecium (X 280).

Fig. 5. Immature asci (X 420).

SINTESIS DE LAS INVESTIGACIONES MICOLOGICAS REALIZADAS EN VENEZUELA DURANTE LOS AÑOS 1946-1956

Dr. HUMBERTO CAMPINS

(Médico Jefe de los Servicios de Dermatología y Laboratorio, Hospital Central, Barquisimeto - Venezuela.)

(28. XI. 1957)

Este trabajo se concreta fundamentalmente a una sintética revisión de las publicaciones venezolanas sobre micología en la década 1946-1956 y está destinado, como es el deseo del Prof. T. BENEDEK, Director de la revista que lo acoge, a facilitar el intercambio científico y el acercamiento personal de quienes se ocupan de est a materia en los diversos países hasta donde llega el importante órgano de divulgación que es Mycopathología et Mycologia applicata. Sinembargo, pensando que pueda ser de interés para algunos y además por razón de justiciero reconocimiento, señalamos también las publicaciones a las cuales corresponde la prioridad en el estudio de cada tema y alguna otra de especial significación.

La primera publicación venezolana que hemos encontrado en nuestra literatura científica, aparentemente relacionada con micología, es de DOROTEO ARMAS (Unión Med. 2.145.1882) y tiene por título: ,,Caso de tiña tonsurante curado con el ácido salicílico y el hielo machacado". El diagnóstico de tiña en este caso fué sólo clínico, no tuvo confirmación micológica ni por cultivo y la descripción que hace el autor de las lesiones, en una paciente de edad avanzada, sugieren el diagnóstico de alopecia areata y no el de tiña. En consecuencia, podemos admitir que fué MONTIEL (1908) el iniciador de la divulgación micológica escrita en Venezuela, con el tema Actinomicosis. Las pocas publicaciones que aparecen en las dos décadas siguientes se refieren a micología médica con diagnóstico solamente clínico o reafirmado en la presencia de granos micósicos en los casos de micetomas. A partir de los últimos años de la tercera década comienza el diagnóstico a basarse en cultivos (CUENCA 1927) y el interés científico desborda el campo médico, enfocando otros aspectos de la Micología (Chardon & TORO 1932). Pero es en los años comprendidos entre 1946 y 1956 que el estudio de la micología ha sido objeto de especial atención en nuestro país. En efecto, en ese lapso se comprobó la existencia de la mayor parte de las micosis profundas que afectan al hombre, se comenzaron a estudiar bien las peculiaridades clínicas, epidemiológicas y micológicas de éstas y de las micosis superficiales, y se realizaron importantes estudios de micopatología vegetal.

Los resultados de tales investigaciones demostraron que la micopatología planteaba entre nosotros problemas médico-sociales dignos de especial consideración, por lo cual en noviembre de 1955 se iniciaron gestiones conducidas a facilitar el estudio y solución de aquellos problemas, las cuales culminaron en Abril de 1957 con la constitución de una Comisión Coordinadora del estudio nacional de las micosis, cuyos objetivos y nómina de miembros insertamos al final de este trabajo.

Micopatologia humana y animal

Actinomicosis y Nocardiasis

No hay aún unanimidad entre los micólogos respecto a la unidad o dualidad genérica de los actinomicetos productores de micetomas. Mientras muchos aceptan un sólo agente de Actinomicosis, el *Actinomyces bovis* o *Israeli* y denominan Nocardiasis la enfermedad causada per actinomicetos aeróbicos a los cuales ubican en el género *Nocardia*, otros son unicistas y llaman Actinomicosis indistintamente toda lesión provocada por aeróbicos o anaeróbicos, dividiéndola en endógena (o autógena) y exógena, según la procedencia del agente causal.

Desde 1908, fecha de la primera publicación venezolana, hasta 1946 se publicaron diez y seis casos de micetomas atribuídos a actinomicetos, de los cuales once eran cervicofaciales, tres torácicos y dos en extremidad de miembros. Sólo en éstos se cultivó el agente y en ambos se identificó con *Actinomyces* o *Nocardia madurae*. Hasta hoy no se ha comunicado el aislamiento de *Actinomyces bovis* de material humano o animal, pero la localización cervicofacial y torácica de los casos humanos aludidos y la existencia de micetomas en la cabeza de vacunos, confirmada por veterinarios, hacen pensar que el *Actinomyces bovis* pueda ser el agente.

MONTEMAYOR (1950) hace una recopilación estadística de sus exámenes micológicos e incluye un caso de micetoma de un pie provocado por *Actinomyces asteroides*. VELUTINI (1951) informa sobre un agricultor del Estado Lara con múltiples lesiones en la mitad inferior de la pared abdominal, pero indemnes los órganos de la cavidad, en el cual se identificó el hongo aislado con *Actinomyces asteroides*. Tratado con yoduro de potasio y sulfatiazol, curó finalmente con radioterapia. CAMPINS (1955) comunica diez casos estudiados por él, en siete de los cuales se obtuvieron cultivos y se identificaron cuatro con *Actinomyces brasiliensis* (LINDERBERG 1909) y tres con *Actinomyces madurae* (VINCENT 1894). Todos eran campesinos, nueve hombres y una mujer. La enfermedad estaba limitada a la piel y tejidos subdérmicos, sin lesionar huesos ni articulaciones para el momento en que fueron estudiados. Dos tenían localización torácica sin participación pleuropulmonar. Nódulos subcutáneos abiertos en la piel por numerosos orificios, era el aspecto clínico de casi todos. Sinembargo, en un caso se encontró tumoración voluminosa de consistencia blanda, sin trayectos fistulosos (Fig. 1). Alude además el autor a un caso con lesiones pulmonares y abcesos subcutáneos en la pared torácica, con granos de *Actinomyces* en el pus, cuyo cultivo no dió desarrollo de colonias. Diversos tratamientos (Yoduros, sulfadiazina, aureomicina) fueron usados sin resultados satisfactorios. Sólo en los casos cuya localización permitió la extirpación quirúrgica, seguida de injertos cuando fué necesario, se logró curación. WENGER (1955) informa de tres casos en los cuales el estudio histológico de biopsias permitió ver granos compuestos de filamentos finos semejantes a Actinomicetos. SALAS & BORELLI (1955) publican un caso de localización torácica cuyo agente fué identificado con *Nocardia brasiliensis*. BARNOLA y col. (1956) comunican otro de micetoma en pie del cual aislaron también *Nocardia brasiliensis*.

En síntesis, no se ha comprobado hasta la fecha la presencia de *Actinomyces bovis* en lesiones humanas ni animales. Se ha obtenido cultivo en doce de los treinta y cuatro casos publicados y se identificaron seis cepas con *Actinomyces* o *Nocardia brasiliensis*, tres con *Actinomyces* o *Nocardia madurae* y tres con *Actinomyces* o *Nocardia asteroides*. La enfermedad se observa en campesinos, predomina en el sexo masculino y se ha encontrado en diversas regiones del país, pero la mayor parte de los casos publicados proceden del Estado Lara.

Maduromicosis

El primer caso de maduromicosis fué publicado por PINO POU (1917). La lesión estaba localizada en pie, tenia granos negros y fué atribuída por el autor a *Aspergillus Baufardy*. Desde entonces hasta 1946 sólo se publica un caso de maduromicosis, con granos blancos, y se atribuye también al género *Aspergillus*. — CONVIT y col. (1950) se refieren a un hombre de 37 años, del Estado Lara, con tumoración en pie izquierdo de 10 años de evolución. Obtuvieron granos negros y su cultivo dió colonias idénticas a *Madurella grísea*, MACKINNON, FERRADA & MONTEMAYOR 1948. CAMPINS (1955) da cuenta de nueve casos en siete de los cuales obtuvo cultivo e identificó cinco cepas con *Madurella grísea*, una con *Madurella americana*, GAMMEL 1926 (especie que MACKINNON ha propuesto pasar a sinonimia de *Madurella mycetomi*) y una quedó sin identificación. WENGER (1955) informa de un micetoma podal con granos negros que no cultivó. MAMBERTI & BORELLI (1956) publican otro caso de localización podal con granos negros, cuya cepa identificaron con *Madurella mycetomi*.

Se reducen a catorce los casos de maduromicosis publicados hasta la fecha, en su mayor parte procedentes del Estado Lara. Todos los pacientes eran de sexo masculino, campesinos, con edades extremas de 10 y 60 años. Once presentaban los caracteres clínicos del pie de madura en forma mas o menos desarrollada: tumoración inflamatoria crónica, de progreso lento, poco sensible, con trayectos fistulosos abiertos en la piel y descargando pequeñas cantidades de líquido seropurulento con granos. En otro paciente existía el mismo tipo de lesión en el tercio inferior de una pierna, y dos presentaban nódulos subcutáneos múltiples con fístulas, uno en antebrazo izquierdo y el otro en hemitórax derecho. Trece tenían granos negros y uno granos blancos. Seis fueron causados por *Madurella grísea*, dos por *Madurella mycetomi* y dos fueron atribuídos al género *Aspergillus*. La terapéutica medicamentosa fué ineficaz en los pacientes que la recibieron. La cirugía fué útil cuando pudo ser aplicada.

Esporotricosis

VEGAS (1935) presenta el primer caso con la comprobación del agente causal, el cual identificó con *Rhinocladium Beurmanni*. Posteriormente aparecen tres publicaciones refiriéndose cada una a un caso diferente. TÁLAMO (1946) se refiere a siete nuevos casos, pero sólo en dos afirma el diagnóstico con cultivo y considera las cepas idénticas a *Rhinocladium Beurmanni*. Eran dos hombres agricultores de 23 y 24 años respectivamente, habitantes del Estado Trujillo, con lesiones ulcerogomosas y nodulares en dorso de mano, antebrazo y brazo derechos, consecutivas, en un caso a herida del índice con fragmento de un árbol y en el otro a penetración en la base del meñique de astilla de una caja de madera para embalaje. HENRÎQUEZ (1954) estudia un caso aún no publicado, cuyo agente, cultivado e identificado en nuestro laboratorio, correspondió al *Sporotrichum Schenkii*. Era un agricultor de diez y ocho años residente en el Estado Lara, quien, después de herida en dorso pie derecho, tuvo lesiones ulcerogomosas en esta región, pierna y muslo. BRICEÑO MAAZ (1955) alude a dos casos de los cuales fué aislado *Sporotrichum Schenkii*, pero no suministra otra información sobre éllos. BORELLI (1956a) al referirse a su casuística, de la cual no da cifra, dice que cerca de la mitad presenta el cuadro linfangítico típico, mostrando el resto diversas expresiones clínicas.

Nosotros hemos estudiado dos pacientes, ambos campesinos, varones, de 48 y 55 años, del Estado Lara. Uno tenía lesión vegetante de superficie granulosa en punta de nariz y lesiones noduloinflamatorias, acneiformes, dispuestas en rosario, desde la naríz hasta lado derecho del cuello. Otras lesiones, ulcerovegetantes, con distribución lineal, iban desde borde cubital de muñeca derecha hasta tercio superior, cara interna, del brazo. La enfermedad había comenzado en naríz 1 año antes. El otro paciente presentaba una extensa lesión inflamatoria crónica, de bordes arciformes, vegestantes y verrugosos, superficie parcialmente cicatrizada y salpicada de

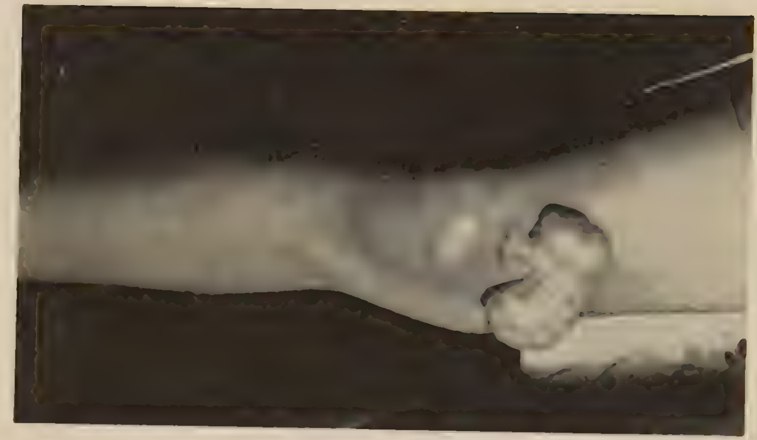


Fig. 1 Nocardiasis. Forma tumoral rara.

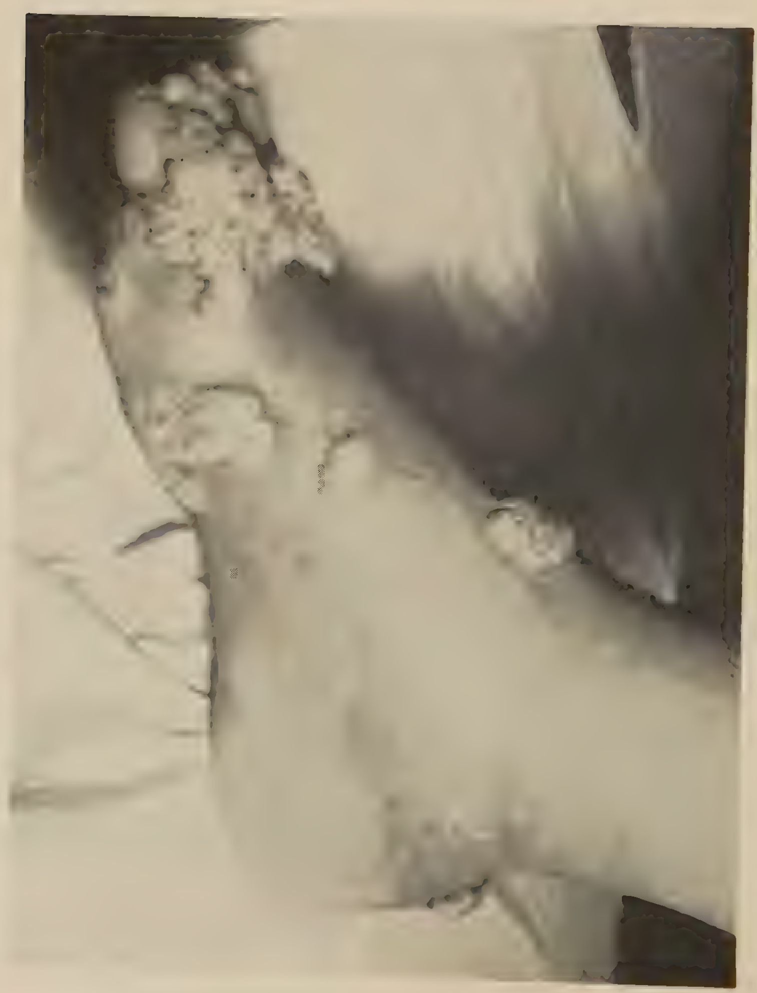


Fig 2 Paracoccidioidomicosis. Lesiones primitivas, vegetantes y [illegible]

papulopústulas pequeñas. Se extendía desde dorso mano izquierda hasta tercio superior de antebrazo, cubriendo a éste, casi en manguito, en su mitad inferior. La enfermedad había comenzado 2 años antes por pequeño nódulo inflamatorio en dorso mano izquierda y avanzó por vía linfática hasta cara antero-interna de brazo correspondiente, donde sólo quedan cicatrices. El diagnóstico se afirmó en cultivo y los pacientes curaron con K. I.

Paracoccidioidomicosis

La Paracoccidioidomicosis, granuloma paracoccidioídico o Enfermedad de Lutz, ha sido la mejor estudiada de las micosis profundas en nuestro país. Se conocen mas de ciento cincuenta casos y las publicaciones son relativamente numerosas. La primera de éllas se refiere a tres autopsias y se debe a O'DALY (1937). El primer caso clínico es publicado por IRIARTE & RODRÍGUEZ (1939). GUERRA (1940) destaca la importancia de la localización pulmonar. CÉLIS PÉREZ (1941) e IRIARTE (1945) señalan las de la esfera bucorrinolaringea. ANGULO ORTEGA (1948) contribuye al conocimiento anatomopatológico revisando material de autopsias del Hospital Vargas de Caracas. BENAIM PINTO (1950) resume la casuística venezolana publicada hasta ese año y comenta siete casos nuevos. CAMPINS & SCHARYJ (1951) insisten sobre el polimorfismo clinico de la enfermedad. BARROS (1951), (1952) hace ligera revisión del tema y alude a seis casos de Paradentosis paracoccidioídica, sin dar pormenores de los mismos y sin indicar los fundamentos del diagnóstico. CÉLIS & GONZÁLEZ (1952) publican un caso de localización primitiva en laringe. DIEZ (1951) califica de paracoccidioidosis esplénica primitiva un caso en el cual traumatismo abdominal rompió el bazo y en sus cortes histológicos encontraron tres blastosporos dentro de células gigantes de un granuloma de cuerpo extraño. CALVO & MERENFEL (1952) insisten sobre las localizaciones de la enfermedad en la cavidad oral y dicen haber observado doce casos, pero sólo en seis el diagnóstico fué confirmado por biopsia o cultivo. BALDÓ (1953) hace una buena evaluación de todo el material venezolano, destaca los aspectos clinico-radiológicos de las formas pulmonares y agrega veintitrés casos a los publicados para esa fecha. PEÑA & MASSÓ (1953) aislan Paracoccidioides brasiliensis por primera vez en Maracaibo. BARROS (1953) revisa la terapeútica de la enfermedad y refiriéndose a la paradentosis producida por el hongo, aconseja la exodoncia como primera medida terapeútica. BENAIM y col. (1954) publican la segunda observación venezolana de asociación de la micosis con tuberculosis. BENAIM (1955) trata dos casos con Pentamidina sin resultado. CAMPINS (1955) enriquece la casuística con ocho observaciones nuevas. WENGER (1955) comenta dos casos estudiados por él. BORELLI (1955a) analiza el examen directo como recurso diagnóstico de la enfermedad y el mismo autor (1955b) destaca aspectos interesantes de la biología del hongo. SEIJAS (1956) publica un caso con tumoración inflamatoria de región deltoidea e invasión humeral subyacente, sin otra localización aparente. RODRÍGUEZ & RINCÓN (1957) informan de treinta y tres pacientes cuidadosamente estudiados.

En los numerosos casos estudiados en Venezuela, la morfología del hongo en tejidos y cultivos corresponde a la descripción de Paracoccidioides brasiliensis (SPLENDORE 1912), ALMEIDA 1930. Como en otros países, la mayor parte de los pacientes afectados por esta enfermedad son campesinos o habitantes de ambientes semi-rurales, pero es interesante destacar que de los veintitrés estudiados por BALDÓ (1953) doce residían en ciudades. Los casos publicados hasta hoy proceden de diversas regiones del centro y occidente del país. El predominio de la enfermedad en el sexo masculino es evidente entre nosotros: esta cerca del 90% en la casuística revisada por BENAIM (1950); alcanza el 91% en la de BALDÓ (1953); casi el 94% en la de RODRÍGUEZ & RINCÓN (1957); y representa el 100% en los casos estudiados por CAMPINS & SCHARYJ (1951) y CAMPINS (1955). Es en la edad adulta donde se observa la mayor incidencia de las formas conocidas. Nuestras cifras extremas en este grupo son 22 y 80 años, prevaleciendo en la cuarta década de la vida. En niños sólo dos casos han sido publicados: POTENZA (1953), BARNOLA & ALVAREZ (1956).

El análisis del material venezolano muestra una alta incidencia de lesiones cutáneo-mucosas, asociadas en su mayor parte con lesiones pulmonares y en menor proporción con alteraciones ganglionares. Las lesiones mucosas encontradas han sido ulceraciones superficiales de bordes nítidos, bases duras y fondos finamente granulosos, moriformes, y las lesiones cutáneas, muy variables en su morfología, tienen, unas los mismos caracteres de las observadas en las mucosas, otras son ulcerocostrosas, y algunas verrugosas, vegetantes y tumorales. (Fig. 2). Las imágenes radiológicas pulmonares obtenidas con mayor frecuencia entre nosotros son los infiltrados nodulares, oscilando desde el minúsculo grano miliar hasta elementos de gran tamaño.

La sulfadiazina sola o asociada con otros derivados de la sulfanilamida, ha dado entre nosotros resultados similares a los obtenidos en otros países.

Cromoblastomicosis

La primera comunicación sobre Cromoblastomicosis en Venezuela fué hecha por O'DALY (1938). Hasta 1946 aparecen tres publicaciones comprendiendo siete casos. CAMPINS & SCHARYJ (1953) publican un estudio clínico, histológico y micológico de treinta y cuatro casos, en el cual destacan la alta incidencia en mujeres (44.4 %) y la frecuente localización de la enfermedad fuera de los miembros inferiores, donde la mayor parte de otros autores, en diversos países, la señalan con predominio; insisten sobre las formas clínicas no verrugosas; señalan ciertos aspectos histológicos; y refieren que han aislado en muchos casos un hongo diferente de las especies generalmente encontradas en otros países. HOMEZ y col. (1954) publican diez casos, haciendo especial referencia a la terapeútica. También en este grupo la localización más frecuente fué en miembros superiores, encontrandose sólo un caso en miembros inferiores y otro en región glútea. WENGER (1955) presenta un cuadro con diez y ocho casos, algunos de los cuales parecen ser de los publicados por HOMEZ. CAMPINS (1955) enriquece la casuística con once observaciones nuevas y eleva a cuarenta y una las cepas aisladas por él.

De cuatro cepas aisladas por O'DALY (1943), tres identificó este autor con *Fonsecaea Pedrosoi* y denominó la otra *Hormodendrum* sp. Esta cepa fué estudiada por A. L. CARRIÓN, quien la admitió como agente de la enfermedad en el respectivo caso. Estudiando nosotros comparativamente la cepa de O'DALY con las veinticuatro mencionadas en el trabajo de CAMPINS & SCHARYJ (1953) encontramos suficiente semejanza entre ellas para que fuesen consideradas como representantes de una misma especie. Nos disponíamos a publicar estas observaciones y a someterlas a la consideración de micólogos autorizados para la adecuada clasificación de tales cepas, cuando ALFONSO TREJO, Laboratorista de Costa Rica, habiéndo leído nuestra publicación e interesado en el problema, nos escribió proponiendo un intercambio de material. Le remitimos parte del nuestro y quedamos en espera del suyo. Meses después lo envió, resultando ser solamente cepas australianas que había recibido de POWELL, y vino seguido por una publicación en la cual propone, basándose en el estudio de cuatro de esas cepas australianas y tres de las nuestras, la denominación de *Cladosporium Carrioni* n. sp. para el hongo en cuestión.

Las edades extremas de los casos venezolanos son 16 y 80 años, registrándose la mayor incidencia entre 20 y 70 años. Todos los pacientes eran labradores o habitantes de medio rural y procedían de varios Estados del centro y occidente del país, pero la mayor parte eran residentes del Estado Lara cuando comenzó la enfermedad y casi todos habitaban regiones áridas, con escasa precipitación pluvial y vegetación seróﬁla, en la cual predominan las plantas espinosas. Un alto porcentaje corresponde al sexo femenino y podría explicarse esta elevada incidencia por la participación activa de nuestra mujer campesina en las labores de su ambiente.

Poco eficaces han sido los tratamientos medicamentosos ensayados. Hace diez años, el autor observó, ocasionalmente, notable mejoría de un caso con Calciferol. En condiciones normales de laboratorio, sometió la cepa de este caso y otras cinco a la acción del Calciferol en diversas concentraciones, pero no observó efecto inhibitorio de su desarrollo sobre ninguna. Tampoco mostró efecto apreciable la droga en tres pacientes tratados posteriormente.

Sinembargo Bonilla, de Costa Rica, publicó en 1954 resultados favorables con Sterogyl 15 (nombre comercial del Calciferol Roussell). La radioterapia ha dado buenos resultados en manos de Homez y col. (1954). Esta forma de terapia, así como la cirugía, ha sido aplicada a lesiones de pequeña extensión. La electrocoagulación ha sido usada en grandes zonas con igual eficacia, pero es necesario que sea bien manejada para evitar reaparición de lesiones en las cicatrices, lo cual ocurre cuando la destrucción no ha sido suficientemente amplia y profunda. Recientemente Lucca (1957) informó del ensayo de extirpación de las superficies enfermas con dermatomo eléctrico, y su resultado, según el autor, era satisfactorio hasta el momento de su informe.

Cladosporiosis Profunda

Desde que Binford y col. publicaron, en 1952, un caso de absceso del cerebro provocado por un hongo que Emmons denominó *Cladosporium trichoides*, varios han sido comunicados, entre ellos uno en Venezuela por Jaffé, Barnola y col (1955). El paciente murió con diagnóstico de hipertensión endocraneana con signos de ocupación de espacio. La autopsia permitió encontrar abscesos que contenían una masa purulenta de color negruzco en la región parieto-frontal del hemisferio derecho del cerebro y en la cara anterior del lóbulo medio del pulmón derecho. Del material de ambas lesiones se aisló un hongo que se identificó con *Cladosporium trichoides*, diagnóstico que fué ratificado por Emmons.

Borelli (1956b) estudió la cepa aislada del cerebro de un indígena del Congo Belga por Lucasse y col. y concluye que no es *Cladosporium Trichoides* sino *Fonsecaea Pedrosoi*. En consecuencia, dice, por lo menos dos especies de dematiáceos deben ser considerados capaces de producir micosis profundas: *Cladosporium Trichoides* y *Fonsecaea Pedrosoi*.

Coccidioidomicosis

La existencia de Coccidioidomicosis en Venezuela fué demostrada por Campins y col. (1949). Poco después Campins (1949) publicó los resultados de una investigación de la sensibilidad cutánea a la Coccidioidina en habitantes del Estado Lara, y con Scharyj y Cortéz (1949), comunicó una nueva observación clínica. Campins (1952) dió cuenta de otro caso con eritema nudoso y Wenger (1955) informó del primer caso con lesiones pulmonares en cuyos cortes histologicos demostró la presencia de *Coccidioides immitis*. Doehnert (1956) informó de dos casos con esa misma localización, diagnosticados en autopsias por presencia de *Coccidioides immitis* en cortes de tejidos. Campins y col. (1956) publicaron tres nuevas observaciones clínicas, una con lesión cutánea aparentemente pura y dos con lesiones óseas. Los resultados de la encuesta con Coccidioidina realizada por Campins (1949) que comprendió más de

7.000 pruebas cutáneas, demostraron la existencia de reactores positivos en los siete Distritos del Estado Lara, con incidencia variable entre 46,4 % y 1,1 %. GUILLÉN (1955) estudió la sensibilidod cutánea a la Coccidioidina en tres grupos de personas de la ciuded de Mérida: escolares, adultos aparentemente sanos y enfermos con tuberculosis pulmonar, y obtuvo 4,3 % de pruebas positivas en el primero, 10,4 % en el segundo y ninguna en el tercero.

Los pocos casos estudiados representan formas clínicas diferentes entre sí pero semejantes a las observadas en otros países. Una paciente, tenía, como única manifestación de la enfermedad, lesiones verrugosas semejantes a las de Cromoblastomicosis (Fig. 3).

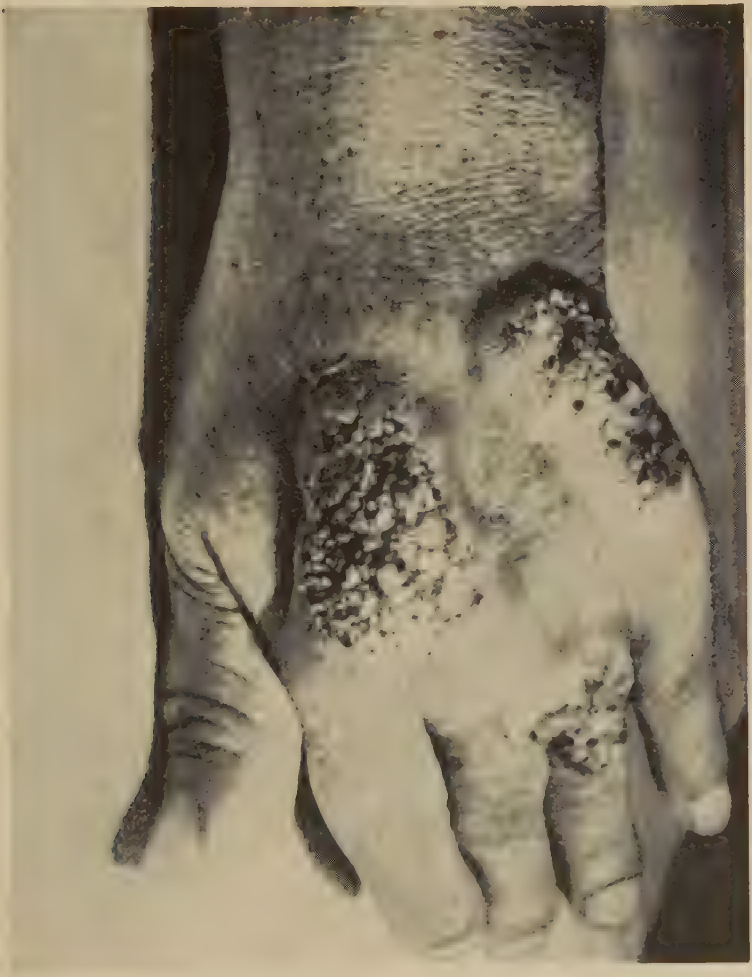


Fig. 3 Coccidioidomicosis. Lesiones primitivas, vegetantes y verrugosas.

Se ha comprobado que en el Estado Lara existe una zona endémica de Coccidioidomicosis, la cual tiene caracteres geológicos semejantes a los de las áreas Norteamericana y Argentina, y climáticos parcialmente diferentes. En efecto, las regiones de mayor incidencia entre nosotros son cálidas y en sus tierras, áridas y polvorientas, predomina la vegtación serófila, pero las lluvias son más abundantes y la temperatura es inferior a la máxima registrada en aquéllas durante los meses calurosos de verano.

Histoplasmosis

Los primeros indicios de la existencia de Histoplasmosis en Venezuela aparecen cuando CAMPINS & SCHARYJ (1950) encuentran 13,7 % de reacciones cutáneas positivas a la histoplasmina al realizar una encuesta en 1836 escolares de Barquisimeto, de los cuales 44 tenían lesiones pulmonares residuales, predominantemente calcificadas, que podían ser atribuídas al *Histoplasma capsulatum*. La confirmación definitiva de la enfermedad fué hecha también por CAMPINS & SCHARYJ (1952). POLLAK (1953) comunicó los resultados de una encuesta sobre sensibilidad cutánea a la histoplasmina en 1.040 personas y sus resultados, 30 % de pruebas positivas, sugieren la posibilidad de que la enfermedad exista en diversas regiones de nuestro territorio. POLLAK y col. (1953) publicaron el segundo caso de esta micosis. CAMPINS y col (1955) informaron de doce personas que sufrieron infección pulmonar primaria, pocos días después de explorar una cueva, en la cual había abundancia de *Histoplasma capsulatum*, como lo demostraron los cultivos del suelo. CAMPINS (1955) informó que el estudio de sensibilidad cutánea a la Histoplasmina en los pobladores de la región vecina a dicha cuvea, realizada en colaboración con CHIESI, dió 38,5 % de pruebas positivas. GUILLÉN (1955) obtuvo en Mérida pruebas positivas que oscilaron entre 7,17 % y 28,3 %, según los grupos de personas estudiadas. VELUTINI y col. (1955) publican el primer caso con localización tegumentaria. BARNOLA y col. (1956) presentan otro de un niño de diez y ocho meses con hepatoesplenomegalia, de cuya médula ósea aislaron *Histoplasma capsulatum*. MONCADA y col. (1956) confirman los hallazgos de GUILLÉN (1955) en un estudio de sensibilidad cutánea realizado en 1.000 habitantes del Estado Mérida. BELLARD y col. (1956) comunican un caso de histoplasmosis pulmonar contraída aparentemente en las cuevas del Peñón (Estado Miranda) y se refieren a otro paciente, quien enfermó después de explorar las cuevas de Ña Plácida (Estado Miranda), y cuya enfermedad atribuyen también al *Histoplasma capsulatum*. BELLARD PIETRI (1957) advierte a los interesados en explorar cavernas en Venezuela, de la posibilidad de contraer de Histoplasmosis en algunas de éllas.

La información derivada de la casuística y de los estudios de sensibilidad cutánea a la histoplasmina, induce a pensar que la

Histoplasmosis existe en casi todo el territorio nacional. La mayor parte de los casos estudiados hasta ahora son de localización pulmonar. Las cepas aisladas son idénticas a *Histoplasma capsulatum* DARLING 1906. Una combinación de sulfadiazina, sulfameracina y sulfamezatina curó a un paciente con localización tegumentaria primitiva y exclusiva. No hubo experiencia terapeútica satisfactoria en los otros casos.

Criptococcosis

La primera publicación venezolana fué hecha por POTENZA & BENAIM (1949). En ella presentan dos casos bajo los diagnósticos clínicos de meningoencefalitis por virus y tumor de hipófisis, respectivamente. La autopsia permitió diagnóstico de meningoencefalitis por *Criptococcus neoformans*. POTENZA y col. (1951) publican otro caso con lesiones pleurales de evolución crónica, en cuya autopsia se encontró además lesiones en meninge y cerebro, causadas todas por *Criptococcus neoformans*, como lo demostraron los cultivos e inoculaciones animales. ANGULO (1955), presenta caso de autopsia con toruloma pulmonar y lesiones cerebrales de igual etiología, demostrada por cultivo e inoculación animal. BARNOLA & MARTÍNEZ (1955) informan de otro paciente con imagen nodular en radiografía pulmonar y signos de hipertensión endocraneana, de cuyo líquido cefalorraquídeo aislaron *Criptococcus neoformans*. WENGER (1955) dice haber encontrado *Torula histolítica* en las meninges de un paciente que murió con diagnóstico de endocarditis y alude además a una mujer a quien practicaron lobectomía (Dr García Galindo) pensando en carcinoma. En los cortes histológicos se encontró *Criptococcus neoformans* y fué cultivado del mismo material. BARNOLA & BARRERA (1956) se refieren a un niño de cinco años con meningoencefalitis y *Criptococcus neoformans* en el líquido cefalorraquídeo.

Las cepas obtenidas en nuestro país corresponden morfológica y biológicamente a la especie tipo. Pacientes de ambos sexos, en edades de plena actividad la mayoría de ellos, con residencia urbana y rural y ocupaciones diversas, son los datos que se derivan de los casos estudiados. Las localizaciones en pulmones y pleura evolucionaron con síntomas de tumores. La afección del sistema nervioso central se manifestó por síntomas de meningoencefalitis o de tumor cerebral. El diagnóstico, errado en la mayoría de los casos, condujo a diversos tratamientos, cuya ineficacia sobre el hongo quedó, de paso, comprobada.

Rhinosporidiosis

POTENZA & CELIS (1947) comunicaron la primera observación venezolana de esta enfermedad, en un hombre de 55 años, albañil, residente del Estado Cojedes, que tenía lesión tumoral en fosa nasal derecha. Los mismos autores (1949) informaron de otro caso en un niño de 11 años, también con lesión nasal, residente en el Estado Aragua. BRUNI & SERRANO (1952) informaron de otro paciente de 18 años, obrero, procedente del Estado Barinas, con lesión nasal. SÁNCHEZ & SCHARYJ (1953) publicaron el caso de un agricultor de 47 años, del Estado Lara, con lesión tumoral en conjuntiva bulbar del globo ocular derecho. ALIZO & WENGER (1953) dieron cuenta de un hombre de 30 años del Estado Trujillo con tumor en fosa nasal. CAMPINS (1955) alude a un caso estudiado por DOMINGUEZ. Era una mujer de 51 años, del Estado Lara, con lesión polipoide en fosa nasal. VOGELSANG (1955) informa de la existencia de Rhinosporidiosis en equinos venezolanos.

Pacientes de ambos sexos entre 11 y 55 años de edad con residencia urbana y rural y ocupaciones diversas, aparecen en la escasa casuística venezolana. LARA, COJEDES, ARAGUA, BARINAS & TRUJILLO son los Estados de los cuales procedían los casos estudiados. Lesiones tumorales, generalmente pediculadas, polipoides, constituyen la única expresión clínica observada hasta ahora entre nosotros. Extirpación quirúrgica o electro-coagulación, solas o combinadas, han sido los recursos terapeúticos aplicados a los casos venezolanos.

Enfermedad de Gilchrist

La enfermedad de Gilchrist o Blastomicosis norteamericana ha sido comprobada en Venezuela por POLO y col. (1954) en un hombre de 56 años quien había vivido siempre en nuestro país y tenía larga residencia en Valencia, Estado Carabobo, donde trabajaba en negocio de panadería. El paciente presentaba tumoración de consistencia dura en hemilengua izquierda, ulceraciones en el borde de la misma y en la mucosa del carrillo correspondiente e hipertrofia linfoide en la base de la lengua, con franco edema de la epiglotis, repliegues ariteno-epiglóticos y región aritenoidea. El diagnóstico se hizo por la morfología del hongo en los tejidos enfermos y por cultivo del mismo.

Candidiasis y Geotricosis

IRIARTE (1946) se refiere a micosis faringeas y estudia amígdalas de las cuales A. L. CARRIÓN, de Puerto Rico, aisla *Cándida Krusei* y *Pennicillium* sp. Alude además el autor a una publicación suya anterior, en cuyo caso el mismo CARRIÓN aisló *Cándida albicans*. POTENZA & FEO (1951) estudiando las causas de esofagitis en los niños encuentran *Cándida tropicalis* en diez de los casos autopsiados, tres de los cuales tenían hongos de este género en los cortes histológicos del órgano. CONVIT & MONTEMAYOR (1951) aislan varias especies de *Cándida* en materiales obtenidos, durante autopsias, de lesiones bronquiales y esofágicas y de diversas lesiones cutáneas, correspondiendo el 50 % de las cepas a *Cándida albicans* y el 25 % a *Cándida* *tropicalis*. GAVALER (1953) encuentra lesiones atribuibles a *Cándida* en 25 % de 288 autopsias de recién nacidos, siendo la parte superior del tracto digestivo la región más frecuentemente afectada. En un niño de 22 días de edad con infección generalizada, comprobó el hongo en diversos órganos, entre ellos el cerebro. IRIARTE (1955) estudia docientos pares de amígdalas y aisla sesenta y siete cepas de hongos: diez y seis de *Cándida albicans;* trece de *Cándida tropicalis;* uno de *Cándida Krusei*, y las restantes, especies de *Geotrichum* y otros géneros. BENAIM y col. (1951) publican dos casos con afección bronco-pulmonar crónica de cuyos esputos aislaron *Geotrichum versiforme* MOORE 1934. Uno de los pacientes tenía tuberculosis pulmonar y el otro bronquitis crónica con manifestaciones asmáticas. SANSONETTI (1954) dice haber confirmado moniliasis en aves.

Dermatomicosis y Tricomicosis

El primer caso de micosis superficial con estudio micológico publicado en Venezuela, parece ser el de VEGAS (1925). Informa de una tiña tundente, provocada por un hongo ectotrix encontrado en los cabellos de un niño y en los pelos del gato de la casa, por lo cual piensa que sea *Microsporum felinum*. Entre las publicaciones aparecidas desde esa fecha hasta 1946, deben señalarse las de BRICEÑO (1937), GUERRA (1939) y BRICEÑO (1943). DI PRISCO (1948) analiza treinta y un casos de tiña del cuero cabelludo de los cuales veinticinco eran endotricias y tres microspóricas. No se determinó el agente en los tres restantes. Sólo cinco cultivos fueron obtenidos, encontrando *Trichophyton asteroides*, *sulfureum* y *crateriforme*, y *Microsporum felineum*. Diez y ocho de estos pacientes fueron tratados con acetato de talio y los resultados, dice el autor, fueron estupendos. El mismo autor (1953) informa sobre treinta y cuatro casos estudiados posteriormente de los cuales se obtuvieron treinta cultivos, correspondiendo catorce a *Microsporum canis*, seis a *Microsporum* sp., seis a *Trichophyton epilans*, dos a *Trichophyton cerebriforme* y dos a *Trichophyton asteroides*. Comenta los resultados obtenidos con diversos tratamientos, señalando la poca eficacia del caldo vacuna denominado comercialmente Dermatomycol. VELUTINI (1953) comunica los primeros casos de Tiña por *Microsporum Audouini* en Venezuela, en dos niños norteamericanos, hermanos, con lesiones en cuero cabelludo, un mes después de su llegada al país. IRIARTE (1955) revisa el tema de las otomicosis y presenta seis casos, de los cuales atribuye cinco a *Aspergillus* y uno a *Penicillium*. BRICEÑO MAAZ (1955) aisla *Aspergillus niger* en once de treinta y un casos de otitis externa, y en noventa y siete casos de micosis superficiales estudiadas, encuentra predominio de *Trichophyton rubrum* y *Trichophyton mentagrophytes;* cinco casos de Piedra por *Piedraia Hortai* y tres de Tricomicosis por *Nocardia tenuis*. DI PRISCO (1957) comunica sesenta y dos casos de Tiña del cuero cabelludo. Obtuvo cultivo en treinta, de los cuales diez y seis eran *Trichophyton tonsurans* y trece *Microsporum canis*. Veintiuno de los pacientes fueron depilados antes de iniciar el tratamiento, doce con acetato de talium y nueve con Rayos X.

Micopatologia Vegetal

Esta materia ha sido objeto de especial atención en Venezuela durante la última década y su estudio lo favorece el Centro de Investigaciones Agronómicas que sostiene en la ciudad de Maracay el Ministerio de Agricultura y Cría.

MALAGUTI (1943) se ocupa de las enfermedades del arroz. MALAGUTI y col. (1951a) estudian la invasión de los arrozales del Estado Portuguesa por *Piricularia Orizae* y MALAGUTI y col (1951b) la influencia del abonamiento sobre el desarrollo de la enfermedad producida por aquélla. MALAGUTI (1951a) identifica con *Rhizotonia solani* el agente productor de la mancha de la hoja envainadora del arroz en el Estado Portuguesa. PONTIS (1951) señala por primera vez en Venezuela la podredumbre del tallo del maíz (*Zea mays*) causada por *Pythium aphanidermatum* y el mismo autor (1952) la encuentra también en la caraota (*Phaseolus vulgaris*). CICCARONE & MALAGUTI (1950) estudian la biología de *Sphacelotheca sorghi* en Venezuela y su acción sobre los cultivos de millo. MALAGUTI & PONTIS (1950) estudian por primera vez el ,,Tizon'' y podredumbre de la raíz en el ,,pimiento''; la ,,podredumbre blanda'' de los frutos de la auyama (*Cucurbita maxima*) y la podredumbre zonal de los frutos del tomate (*Lycopercicum esculentum*), causadas todas por *Phytophtora capsici*. PONTIS & RODRÍGUEZ (1953) señalan el mismo agente como causa de la podredumbre de los frutos de la berengena (*Solanum melongena*). MALAGUTI (1953) encuentra también especie del género *Phytophtora* provocando podredumbre del tallo de ajonjolí (*Sesamun indicum*). MALAGUTI & SIROTTI (1952) atribuyen al ascomiceto *Calostilbe Striispora* la podredumbre de la corteza de los bucares (*Erythrina* Sp.) y del cacao (*Theobroma cacao*). PONTIS & RODRÍGUEZ (1952) informan de la existencia del ,,oidio'' o ,,blanco'' de la lechoza (*Carica papaya*) causado por *Oidium caricae*. RODRÍGUEZ (1952) estudia la viruela del tomate y hace observaciones sobre morfología y patogenicidad del agente, *Septoria licopersici*, y de su tratamiento y control. MALAGUTI (1950) informa de seria enfermedad de *Carthamus thintorius* por especie de *Phytophtora*. El mismo autor (1951b) estudia la podredumbre del tallo de *Crotalaria juncea* por *Cerathostomella fimbriata*. MALAGUTI & PONTIS (1952) estudian la podredumbre de las raíces del aguacate (*Persea americana*) por *Phytophtora cinnamomi*. MALAGUTI & VISO (1954) estudian la posibilidad de controlar con fungicidas la pudrición de los esquejes de la caña de azúcar. PERLASCA & MALAGUTI (1954) tratan de librar al tomate, cultivado en época de lluvia, de la acción de *Phytophtora infestans*. MALAGUTI (1955) establece que la enfermedad llamada Escobilla del algodón es causada por el hongo *Colletotrichum gossyppii*. MALAGUTI &

NARANJO (1955) estudian una seria enfermedad de la parcha (*Passiflora quadrangularis*) producida por especie de género *Alternaria* y la denominan Alternariosis de la parcha. MALAGUTI (1956a) investiga el problema de las micosis del tronco del cacao ocasionado por *Cerastostomella fimbriata* y el mismo autor (1956b) estudia la posibilidad de control biológico, mediante hongos, de las malas hierbas que perjudican a los cultivos de arroz y maíz. Un índice alfabético de los huéspedes y patógenos en Venezuela fué publicado por STANDEN (1951).

Temas Diversos

CHARDON & TORO (1932) publican un interesante estudio, fruto de sus exploraciones micológicas en Venezuela. TEXERA (1948) estudia la producción de antibióticos por hongos del género *Fusarium* y por Micobacterias y Mixomicetos. GONZÁLEZ RINCONES (1952) dice haber confirmado observaciones de otros autores relativas a la acción de la tierra incorporada a los medios de cultivo, sobre dermatofitos. BORELLI (1954) comunica modificaciones de la técnica de cultivo en láminas que considera útiles, especialmente cuando se tratan hongos frágiles. RODRÍGUEZ (1955) estudia doce nuevas especies de Myxomycetes con lo cual asciende a treinta y cuatro el número de éllas reconocidas en el país. ILUKEWITSCH (1955) informa de nuevas sustancias químicas inhibidoras del desarrollo in vitro de *Histoplasma capsulatum* y *Blastomyces brasiliensis*. BORELLI (1955) identifica *Sporotrichum gougeroti* con *Phialophora Jeanselmei* y propone la denominación de *Phialophora Gougerotii*. FEO (1956) informa de un fracaso en la conservación de cultivos de hongos bajo parafina líquida y supone que impurezas de esta hayan sido la causa de la muerte de sus cepas. BORELLI & FEO (1956) publican la lista de las cepas fúngicas que integran la colección de la Cátedra de Bacteriología de la Facultad de Medicina de la Universidad Central de Venezuela. POTENZA & FEO (1956) recomiendan la luz polorizada como método útil para la visualización microscópica de hongos en cortes de tejidos humanos y animales.

La Comisión Coordinadora del estudio nacional de las micosis está integrada por:

Dr. JOSE IGNACIO BALDO: Presidente. Jefe División Tuberculosis, Ministerio de Sanidad y Asistencia Social. Profesor de Clínica Tisiológica. Universidad Central de Venezuela. Caracas.

Dr. A. L. BRICEÑO ROSSI: Director Instituto Nacional de Higiene. Ministerio de Sanidad y Asistencia Social. Profesor Agregado Cátedra Higiene y Medicina Social. Universidad Central de Venezuela. Caracas.

Dr. FELIX PIFANO C.: Profesor Titular Cátedra Medicina Tropical. Universidad Central de Venezuela. Caracas.

Dr. Jacinto Convit: Jefe División de Lepra. Ministerio de Sanidad y Asistencia Social. Profesor agregado Cátedra Clínica Dermatológica y Sifilográfica. Universidad Central de Venezuela. Caracas.

Dr. Tulio Briceño Maaz: Director Departamento Médico. Mene Grande Oil Company. San Tomé — Edo. Anzoategui.

Dr. Humberto Campins: Médico Jefe Servicios Dermatología y Laboratorio. Hospital Central. Barquisimeto.

Dr. Jose Barnola D.: Profesor Asociado Cátedra Bacteriología y Parasitología. Jefe Laboratorio Hospital Militar y Naval. Universidad Central de Venezuela. Caracas.

Dr. H. Benaim Pinto: Profesor Asociado Cátedra Clínica Médica. Universidad Central de Venezuela. Caracas.

Dr. Alberto Angulo Ortega: Jefe Departamento Anatomía Patológica. Instituto Nacional de Tuberculosis. Profesor Agregado Cátedra Anatomía Patológica. Universidad Central de Venezuela. Caracas.

Dr. Luis M. Carbonell: Profesor Agragado Cátedra Anatomía Patológica. Universidad Central de Venezuela. Caracas.

Dr. Alejandro Principe M.: Jefe Departamento Epidemiología y Estadística, Instituto Nacional de Tuberculosis. Ministerio de Sanidad y Asistencia Social. Caracas.

Dr. Leo Stachowsky: Otorrinolaringólogo División Tuberculosis, Ministerio de Sanidad y Asistencia Social. Caracas.

Dr. Jose Garcia Lopez: Odontólogo División Tuberculosis. Ministerio de Sanidad y Asistencia Social. Caracas.

Son propósitos fundamentales de esta Comisión estimular el estudio de los diversos aspectos del problema de las micosis y favorecer la enseñanza de la micología suministrando, según los casos, orientación, informaciones, pautas y materiales de trabajo; coordinando los esfuerzos de servicios y personas interesadas en la materia; y procurando obtener recursos técnicos y económicos que faciliten la realización de los programas de trabajo.

Resumen

La Micología ha sido objeto de especial atención y estudio en Venezuela durante la década 1946—1956. Puede decirse que en este país se ha comprobado la existencia de todas las micosis humanas hasta ahora conocidas y se están realizando trabajos con el objeto de precisar bien sus peculiaridades clínicas, micológicas y epidemiológicas.

La Micopatología vegetal ha sido, asimismo, motivo de particular interés y continúan estudiándose sus diversos aspectos.

El autor comenta brevemente las publicaciones venezolanas sobre la materia y suministra amplia bibliografía.

Summary

Mycology has been the object of special attention and study in Venezuela, during the decade 1946—1956. It may be said that in this country, it was given evidence of the existence of all the human mycoses known to this day and works are being done with the purpose of establishing well their clinical, mycological and epidemiological peculiarities. The vegetal Mycopathology has been as well, a topic of particular interest and its divers aspects are being studied.

The author comments briefly the Venezuelan publications on the subject and offers ample bibliography.

Bibliografia

ALIZO, V. & WENGER, F. (1953) Rhinosporidiosis nasal. Rev. Policl. Caracas, **21,** 206.

ANGULO ORTEGA, A. (1948) La Paracoccidioidosis en el Servicio de Anatomía Patológica del Hospital Vargas de Caracas. Rev. Sud. Morfol., **6,** 145.

ANGULO, A. (1955) Toruloma pulmonar. III Jorn. Venezol. Anatom. Patol. Maracaibo, 1955.

BALDÓ, J. I. (1953) Paracoccidioidomicosis pulmonar. Rev. Sanid. Asist. Soc. de Venezuela., **18,** 163.

BARNOLA, J., SCANNONE, F. & VELUTINI, L. (1956) Micetoma podal por Nocardia brasiliensis. IV Jornadas Venezol. Anat. Patológica. Mérida, Feb. **1,** 956.

BARNOLA, J. & ALVAREZ, P. (1956) Paracoccidioidosis de forma ganglionar, infantil. III Jorn. Venez. Pueric y Pediat. 8 dic. 1956. Maracaibo.

BARNOLA, J., MENDOZA, E. S. & ALVAREZ, P. J. (1956) Histoplasmosis Infantil. III Jorn. Venezol. Pueric. y Pediat. Maracaibo, 8 dic. 1956.

BARNOLA, J. & MARTÍNEZ, A. (1956) Torulopsis cerebral. III Jorn. Venezol. Anat. Patol. Maracaibo, 1955.

BARNOLA, J. & BARRERA, G. (1956) Criptococcosis infantil. III Jorn. Venezol. Pueric. y Pediat., Maracaibo, 8 dic. 1956.

BARROS, J. H. (1952) Estudio general de la Paracoccidioidosis brasiliensis. Su importancia en Odontología. Bol. Clin. L. Razetti, **16,** 493.

BARROS, J. H. (1951) Acerca de la primera comunicación sobre Paradentosis Paracoccidioídica. Venezuela Odontológica, **16,** 39.

BARROS, J. (1953) Tratamiento de la Paracoccidioidosis brasiliensis. Rev. Soc. Odontol. de la Cruz Roja Venez., **1,** 22.

BELLARD, E. P. DE, BRICEÑO, L., PARDO, G., REQUENA, A. & POLLAK, L. (1956) La Histoplasmosis en Venezuela. Observaciones. Gac. Med. de Caracas, **63,** 191.

BELLARD PIETRI, E. (1957) Grave enfermedad identificada en varias cuevas de Venezuela. Universitas Emeritenses. Rev. Univ. de los Andes, **4,** 62.

Beaím Pinto, H. (1950) Contribución al estudio de la Paracoccidioidosis brasiliensis en Venezuela. Archiv. Venezol. Patol. Trop. y Parasit. Med., **2**, 183.

Benaím, H. & Coll, E. (1954) Paracoccidioidosis de forma mucosaganglionar asociada a tuberculosis extrapulmonar y hepatitis en en sujeto con miocarditis crónica. Acta Med. Venezol., **2**, 153.

Benaím, H. (1955) Ensayo de las Pentamidinas en el tratamiento de la Paracoccidiodosis brasiliensis. Acta Méd. Venez., **3**, 82.

Benaim, C., Gomez O. L., Montemayor, L. & Ríos, F. (1951) Afecciones broncopulmonares crónicas con hallazgo de hongos del género 'Geotrichum' en los asputos. Mem. II Jorn. Venezol. de Vener. Dermat. y Lepra. Caracas, 473.

Borelli, D, (1956a) Cenni di micopatologia venezuelana. Giorn. Ital. Dermato. e Sifil., **5**, 507.

Borelli, D. (1955a) Ventajas y peligros del examen directo en fresco en el diagnóstico de la Blastomicosis Sudamericana. Memorias VI Congreso Venezol de Cienc. Méd. 18—26 Nov. 1955, **4**, 2. 159.

Borelli, D. (1955b) Las aleurias de Paracoccidioides brasilensis. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov. 1955, **4**, 2. 241.

Borelli, D. (1956b) Cladosporiosis profunda. Revisión de una cepa. Bol. Laborat. clín., **1**, 29.

Borelli, D. (1954) Nota técnica sobre el cultivo en lámina de los hongos frágiles. Rev. Policl. Caracas, **22**, 285.

Borelli, D. (1955) Sporotrichum Gougeroti, Hormiscium Dermatitides, Phialophora Jeanselmei Phialophora Gougeroti (Matruchot, 1910) comb. n. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov. 1955. **5**, 2. 945.

Borelli, D. & Feo, M. (1956) Cepas fungicas. Rev. Facul. Med. Caracas, 2, 164.

Briceño Iragorry, L. (1937) Contribución al estudio de la parasitología de la tiña tonsurante en Venezuela, Gac. Méd. de Caracas **44**,, 115.

Briceño Iragorry, L. (1943) Dermatomicosis en Venezuela. Rev. Sanid. As. Soc. Caracas, **8**, 929.

Briceño Maaz, T. & Briceño Maaz, C. de (1955) Investigaciones micológicas en el Estado Anzoátegui, Venezuela. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov., 1955, **5**, 2. 877.

Bruni, B. & Serrano, O. (1952) Tercer caso de Rhinosporidiosis nasal humana en Venezuela. II Convenc. Asoc. Venezol. Av. de la Ciencia.

Calvo, A. & Merenfeld, R. (1952) Algunas consideraciones sobre micosis de la boca vistas en el Servicio de Oncología del Hospital Vargas. Venez. Odontológica, **16**, 24.

Campins, H. Scharyj, M. & Gluck, V. (1949) Coccidioidomicosis (Enfermedad de Posadas). Su comprobación en Venezuela, Archiv. Venezol. Patol. Trop. y Parasit. Med., **1**, 215.

CAMPINS, H., SCHARYJ, M. & CORTEZ, R. J. (1949)b Coccidioidomicosis en Venezuela. Relación del segundo caso estudiado. Cac. Med. de Caracas. **57,** 229.

CAMPINS, H. (1949) Coccidioidomicosis. Un nuevo problema de salud pública en Venezuela. Rev. Sanid. Asist. Soc. Caracas, **15,** 1.

CAMPINS, H. & SCHARYJ, M. (1950) Investigación de la sensibilidad cutánea a la Hisplasmina en Venezuela. Archiv. Venezol. Patol. Trop. y Parasit. Méd. **2,** 75.

CAMPINS, H. & SCHARYJ, M. (1951) El Polimorfismo clínico de la Micosis de Lutz. Memoria II Jorn. Venezol. de Vener. Dermat. y Lepra, 10—16 mayo 1951, 503.

CAMPÍNS, H. & SCHARYJ, M. (1952) Comprobación de la Histoplasmosis en Venezuela. Gac. Méd., de Caracas, **61,** 67.

CAMPINS, H. & SCHARYJ, M. (1953) Chromoblastomicosis. Comentarios sobre 34 casos con estudio clínico, histológico y micológico. Gac. Méd. de Caracas, **61,** 127.

CAMPINS, H., ZUBILLAGA, C., GÓMEZ LÓPEZ, L. & DORANTE, M. (1955) Estudio de una epidemia de Histoplasmosis en el Estado Lara, Venezuela, Gac. Méd. de Caracas, **62,** 85.

CAMPINS, H. (1955) Micosis profundas endémicas en Venezuela. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov. 1955, **5,** 2. 786.

CAMPINS, H., IRIGOYEN, L. & SEIJAS, O. (1956) Coccidioidomicosis. Nuevos casos venezolanos. Inform. Méd. **1,** 17.

CELIS PÉREZ, A. (1941) Las localizaciones buco-rinofaringo-laringeas del Granuloma a Paracoccidioides. Estudio clínico. Rev. Policl. Valencia, **1,** 25.

CELIS., A. & GONZÁLEZ, C. (1952) Un caso de Paracoccidioidosis primitiva de la laringe. Bol. Serv. O. R. L. Hosp. Cent. Valencia, **2,** 53.

CELIS, A. & POTEMZA, L. (1949) Rhinosporidiosis en Suramérica. Dos observaciones en Venezuela. Memor. Primer. Congr. Latinoamericano de O.R.L., **2,** 532.

CICCARONE, A. & MALAGUTI, G. (1950) Prime prove di campo e di Laboratorio per la lotta contro Sphacelotheca Sorghi (L.K.) Clint e per la conoscenza della sua biologia in Venezuela. Riv. di Agricol. Subtrop. e Trop. Firenze, **44,** 145.

CONVIT, J., SALAS, A. & MONTEMAYOR, L. (1950) Micetoma de granos negros. Rev. Policl. Caracas, **18,** 322.

CONVIT, J. & MONTEMAYOR, L. (1951) Hongos levaduriformes. Estudio micológico e identificación de 16 cepas. Mem. II Jorn. Venezol. de Vener. Dermat. y Lepra. Caracas, 465.

CUENCA, H. (1927) Micetoma de granos blancos. Rev. Soc. Med. Quir. Zulia, **1,** 56.

CHARDON, C. E. & TORO, R. (1932) Exploraciones micológicas en Venezuela. Bol. Soc. Venez. de Cienc. Nat, **8,** 281.

DIEZ, A. (1951) Paracoccidioidomicosis esplénica primitiva. Bol. Soc. Venez. Cir. **4,** 137.

Di Prisco, J. (1948) Las tiñas en el medio escolar de Caracas. Rev. Pol. Caracas, **17**, 230.

Di Prisco, J. (1953) Nueva contribución al estudio de la tiña en el medio escolar de Caracas, y su tratamiento. Rev. Pol. Caracas, **21**, 225.

Di Prisco, J. (1957) Nota acerca de las tiñas del cuero cabelludo y su tratamiento con sales de talio y con radioterapia. Rev. Pol. Caracas, **25**, 19.

Doehnert, H. (1956) Coccidioidomicosis pulmonar. Acta Méd. Venezol, **4**, 147.

Feo, M. (1956) La parafina líquida como medio de conservación de los hongos. Rev. Facul. Med. Caracas, **2**, 22.

Gavaler, B. (1953) Moniliasis en los recién nacidos. Rev. Obst. y Ginec., **13**, 203.

González Rincones, R. (1952) La Tierra, mutante de los hongos incorporada a los medios de cultivo. Gac. Méd. Caracas, **40**, 191.

Guerra, P. (1939) Notas sobre las epidermomicosis de la región caraqueña. Bol. Hosp. **7-8**, 245.

Guerra, P. (1940) El granuloma a Paracoccidioides. Su importancia en patología pulmonar. Rev. San. Asist. Soc. Caracas, **5**, 921.

Guillén, C. (1955) Sensibilidad cutánea a la histoplasmina, coccidioidina y tuberculina. Investigación en grupos seleccionados Tesis Doctoral, Merida, Julio 1950.

Henriquez, J. J. (1954) Caso de Esporotricosis. Inédito.

Homez, J., Fernández, J. & Masó, J. (1954) Diez casos de Cromoblastomicosis de los Estados Zulia y Falcón. Tratamiento con Radioterapia. Rev. Soc. Méd. Quir. Zulia, **28**, 5.

Ilukewitsch, A. (1955) Experimentos fungistáticos ,,in vitro'' con 71 distintos productos químicos. Nuevas sustancias inhibidoras para los hongos: Histoplasma capsulatum — Darling (1906) y Blastomyces Brasiliensis — Conant y Howell (1941) — Rev. San. Asist. Soc. Venezuela, **20**, 339.

Iriarte, D. & Rodríguez, C. (1939) Un caso de granulomatosis Paracoccidioídica o Blastomicosis brasilera. Rev. Clinica L. Razetti, **2**, 209.

Iriarte, D. (1945) Consideraciones sobre Paracoccidioidosis. Bol. Lab. Clin. L. Razetti, **6**, 277.

Iriarte, D. (1946) Micosis Faríngeas. Bol. Labor. Clin. L. Razetti, **21—22**, 483.

Iriarte, D. (1955) Presencia de hongos en las amigdalas. Mem. VI Congr. Venezol. de Cienc. Méd., **4**, 2.201.

Iriarte, D. (1955) Otomicosis. Bol. Labor. Clínica L. Razetti, **16**, 677.

Lucca, D. (1957) Tratamiento quirúrgico de la Cromoblastomicosis. Presentado en Coleg. de Médicos. Caracas. Junio 1957.

Jaffé, R., Barnola, J. Martínez, A. & Rivas, M. (1955) Cladosporiosis cerebral III Jorn. Venez. de Anat. Patol, feb. 1955, Maracaibo.

MALAGUTI, G. (1943) Enfermedades del arroz en Venezuela, Boletín No 4 del M.A.C. Caracas.

MALAGUTI, G. (1950) Phytophtora Blight of Safflower. Phytopathology, **40**, 1154.

MALAGUTI, G., & PONTIS, R. E. (1950) Phytophtora Capsici in Venezuela. Rev. di Agricol. Subtrop. e Trop. Firenze, **44**, 4.

MALAGUTI, G., SILVA, J. & RAVANELLO, G. (1951a) Condiciones que favorecieron el desarrollo del Brusone (Piricularia Oryzae Cav.), en los arrozales del Estado Portuguesa en el año 1950. Agron. Tropic. Venezuela, **1**, 30.

MALAGUTI, G., SILVA, J. & RAVANELLO, G. (1951b) Ensayos acerca de la influencia del abonamiento sobre el ,,Brusone del arroz'' (Piricularia Oryzae Cav.) Agron. Tropic. Venezuela, **1**, 131.

MALAGUTI, G. (1951a) Mancha de la hoja envainadora del arroz causada por Rhizoctonia Solani. Agron. Tropic. Venezuela, **1**, 73.

MALAGUTI, G. (1951b) Una podredumbre del tallo de Crotalaria juncea, causada por Ceratostomella fimbriata, Agron. Tropic. Venezuela, **1**, 287.

MALAGUTI, G. & PONTIS, R. E. (1952) La podredumbre de las raíces del aguacate (Persea americana Mill) en Venezuela. Agron. Tropic. Venezuela, **2**, 77.

MALAGUTI, G. & SIROTTI, L. (1952) Podredumbre de la corteza de los bucares (Erytrina Sp. p) y del cacao (Theobroma cacao) en Venezuela. Agron. Tropic. Venezuela, **2**, 41.

MALAGUTI, G. (1953) Una podredumbre del tallo del ajonjolí (Sesamum indicum L) causada por Phytophtora. Agron. Tropic. Venezuela, **3**, 201.

MALAGUTI, G. & VISO, A. (1954) La pudrición de los esquejes de la caña de azúcar y posibilidad de su control con fungicidas. Agron. Tropic. Venezuela, **4**, 61.

MALAGUTI, G. (1955) La escobilla del algodón en Venezuela. Agron. Tropic. Venezuela, **5**, 73.

MALAGUTI, G. & NARANJO, E. (1955) Alternariosis de la Parcha. Agron. Tropic. Venezuela, **5**, 111.

MALAGUTI, G. (1956a) La necrosis del tronco del cacao en Venezuela. Agron. Tropic. Venezuela, **5**, 207.

MALAGUTI, G. (1956b) Posibilidad de control biológico de dos malas hierbas mediante hongos. Agron. Tropic. Venezuela, **6**, 23.

MAMBERTI, S. & BORELLI, D. (1956) Un micetoma Podal por Madurella mycetomi en Venezuela. Gac. Méd. de Caracas, **64**, 279.

MONCADA, F., SEQUERA, H. & GABALDÓN PARRA, A. (1956) Encuesta epidemiológica de tuberculina, coccidioidina e histoplasmina en 1.000 personas en el Estado Mérida. III Jorn. Tisiológicas Nacionales. Mérida, 8 dic. 1956.

MONTEMAYOR, L. (1950) Síntesis estadística y algunos conclusiones sobre exámenes micológicos. Rev. Med. Vet. y Parasit. **9**, 85.

MONTIEL, S. (1908) El primer caso de actinomicosis comprobado en el Zulia. La Beneficiencia. Maracaibo.

O'Daly, J. A. (1937) Las Blastomicosis en Venezuela. Bol. Hosp. Caracas, **36,** 127.

O'Daly, J. A. (1938) Las Cromoblastomicosis. Rev. Policl. Caracas, No **44,** 2.300.

O'Daly, J. A. (1943) Las Cromoblastomicosis en Venezuela. Rev. Sanid. Asist. Soc. de Venezuela, **8,** 655.

Peña, B. & Masó, J. F. (1953) Paracoccidioides. Public. Hosp. Niños Maracaibo, **12,** 15.

Perlasca, G. & Malaguti, G. (1954) Ensayos de cultivo de tomate en la época de lluvias. Agron. Tropic. Venezuela, **4,** 95.

Pino Pou, R. (1917) Sobre un caso de micetoma de granos negros. Vargas, **8,** 298.

Polo, F. J., Brass, K. & Montemayor, L. (1954) Enfermedad de Gilchrist en Venezuela. Rev. Sanid, Asist. Soc. Caracas, **19,** 217.

Pollak, L. (1953) Histoplasmosis en Venezuela. Ensayo epidemiológico. Rev. Sanid. Asist. Soc. Caracas, **18,** 569.

Pollak, L., Rodríguez, C. & Adrianza, M. (1953) Histoplasmosis pulmonar. Presentación de un caso. Acta Méd. Venezol. **1,** 242.

Pontis, R. E. (1951) Una podredumbre del tallo del maíz (Zea mays L.) en Venezuela causada por Pythium Aphanidermatum. Agron. Tropic. Venezuela, **1,** 13.

Pontis, R. E. (1952) Una podredumbre de la caraota (Phaseolus vulgaris L.) en Venezuela, causada por Pythium Aphanidermatum) Agron. Tropic. Venezuela, **2,** 207.

Pontis, R. E. & Rodríguez, A. (1952) El ,,oidio'' o ,,blanco'' de la lechoza (Carica papaya L.) en Venezuela causado por Oidium caricae Noak. Agron. Tropic. Venezuela, **2,** 55.

Pontis, R. E. & Rodríguez, A. (1953) Una podredumbre de los frutos de la berenjena (Solanum melongena L.) en Venezuela causada por Phytophtora capsici Leonian, Agron. Tropic. Venezuela, **3,** 117.

Potenza, L. & Celis, A. (1947) Rhinosporidiosis nasal humana, Primera observación venezolana. Rev. Policl. Caracas, **16,** 245.

Potenza, L. & Benaím, H. (1949) Observaciones en Venezuela de dos casos de Torulopsis (criptococcus neoformans) en el sistema nervioso central. Archiv. Venezol. Patol. Trop. y Parasit. Méd. **1,** 235.

Potenza, L., Rodríguez, C. & Feo, M. (1951) Torulopsis neoformans pleural. Estudio clínico, patológico y micológico del primer caso observado en Venezuela. Rev. Sanid. Asist. Soc. Caracas, **16,** 195.

Potenza, L. & Feo, M. (1951) Contribución al estudio de las esofagitis en los niños. Archiv. Venezol. Pueric. y Pediat., **14,** 224.

Potenza, L., Lares, C. & Feo, M. (1953) Paracoccidioidosis infantil en Venezuela. Archiv. Venezol. Pueric, y Pediat., **16,** 7.

Potenza, L. & Feo, M. (1956) Use of polarized light in diagnosis of mycotic infections. Amer. Journ. of Clin. Path., **26,** 543.

RODRÍGUEZ, A. (1952) Contribución al estudio de la ,,viruela'' del tomate en Venezuela. Agron. Tropic. Venezuela, **1,** 251.

RODRÍGUEZ, G. (1955) Adiciones a los Myxomycetes de Venezuela. Bol. Museo Cienc. Nat., **1,** 2.

RODRÍGUEZ, C. & RINCÓN, N. (1957) Contribución al estudio de la Paracoccidioidosis Brasiliensis en Venezuela. Rev. Centro Méd. de Caracas, No 12, 9.

SALAS, A. & BORELLI, D. (1955) Micetoma torácico producido por Nocardia brasiliensis. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov. 1955, **5,** 2.903.

SÁNCHEZ, R. A. & SCHARYJ, M. (1953) Rhinosporidiosis. Un caso con localización conjuntival. Rev. Policl. Caracas, **21,** 45.

SANSONETTI DE REAL, A. (1954) Moniliasis en aves (Gallus dom.) de Venezuela. Rev. Med. Vet. y Parasit., **13,** 181.

SEIJAS, O. (1956) Contribución al estudio de la Paracoccidioidomicosis ósea. Gac. Méd. de Caracas, **53,** 225.

STANDEN, J. H. (1951) Indice alfabético de los nombres científicos de huéspedes y patógenos en Venezuela. Bol. Soc. Venez. Cienc. Nat., No **78,** 53.

TÁLAMO, S. (1946) La Esporotricosis en Venezuela. Rev. Soc. Méd. de Trujillo, **1,** 305.

TEXERA, D. A. (1948) Propidades antibióticas de Mixobacterias y Mixomicetos. Acta Biológ. Venezuélica, **1,** 55.

VEGAS, M. (1925) Nota preliminar acerca de un caso de tiña tundente de origen felina. Rev. Med. y Cir. Caracas, **82,** 49.

VEGAS, M. (1935) Primer caso de Esporotricosis en Venezuela. Rev. Policl. Caracas, **21,** 13.

VELUTINI, L. A. (1951) Sobre un caso de actinomicosis abdominal primitiva de la piel, Memoria II Jornadas Venezol. de Vener. Dermat. y Lepra. 519. Editorial Bellas Artes, Caracas, 1955.

VELUTINI, L. (1953) Primeros casos de tiña tonsurante humana en Venezuela, producidos por el Microsporum Audouini y su tratamiento por medio de la depilación con Rayos X. Acta Méd. Venezol, **1,** 54.

VELUTINI, L., BORELLI, D. & RODRÍGUEZ, G. (1955) Histoplasmosis. Nota preliminar sobre un caso proveniente de Barinas, con localización cutáneomucosa. Gac. Méd. de Caracas, **62,** 1.

VOGELSANG, E. Q. (1955) Rhinosporidium Seeberi, parásito del equino de Venezuela. Rev. Médic. Vetern. y Parasit., **14,** 27.

WENGER, F. (1955) Las micosis profundas en el material de Anatomía Patológica de Maracaibo. Memorias VI Congreso Venezol. de Cienc. Méd. 18—26 nov. 1955, **5,** 2.888.

A CRITICAL SURVEY OF MEDICAL MYCOLOGY IN ISRAEL 1946-1956

by

F. Raubitschek

(*From the Department of Dermatology and Venereology* (*Dr.* F. Sagher, *Director,*) *Hadassah University Hospital, Jerusalem, Israel.*)

(24.XII.1957)

Dermatophytes

Tinea capitis

In the first report on medical mycology issued from this country Dostrovsky (1, 1a) presented his experience on the treatment of 2,500 school children suffering from tinea capitis. Some of the children received local treatment only, and in others this was combined with either thallium or X-ray epilation. Results with thallium were inconsistent and its toxicity lead to an early discontinuation of its use. Kaplan & Raubitschek (2) reported on Kerion Celsi in two brothers caused by *A. schoenleini*. An outbreak of therapy-resistant Tinea capitis and Tinea corporis in two brothers and Tinea corporis in their parents, caused by *T. megnini*, was described by Raubitschek (13). In a survey of 6,390 cases of Tinea capitis covering the period from 1926 to 1953 Dostrovsky, Kallner, Raubitschek & Sagher (15) showed that under the age of two, Tinea capitis was a rarity. Most cases of Tinea capitis occurred between the ages of 5 to 11 years; no definite difference between the sexes could be noted. A number of cases were found among adult females. All cases were either "black-dot" trichophytia or favus. Most of the patients were immigrants from the Middle East and North African countries. No microsporia cases were encountered. The main causative organism of the trichophytia infection was *T. violaceum*. Favus was caused exclusively by *T. schoenleini*. The treatment consisted in most cases of X-ray epilation followed by mechanical epilation and tincture of iodine applications. The rate of recurrences was 2.5 %. Irregularities, however, in any stage of the treatment considerably increased the incidence of relapses. Thallium epilation used during the early period of this investigation resulted in 47.6 % of recurrences, as well as in frequent toxic side effects, and was therefore abandoned. Berlin & Meyrovitz (16) reported on 1,877 cases of Tinea capitis seen during 7 years in the Tel-Aviv Municipality Hospital Out-patient Department. Above the age of 13 their cases showed a higher incidence of Tinea capitis trichophytica in girls, whereas below this age more boys were infected. The authors assumed that androgens have a stronger inhibiting effect on Tinea capitis than estrogens.

Tinea of Glabrous Skin and Nails

Dostrovsky, Sagher & Raubitschek (3) examined microscopically material taken from all the finger and toe nails in 49 patients suffering from Tinea pedis, with or without involvement of the hands. They found fungi not only in nails which showed gross changes but in 13 nails which appeared clinically normal.

Infected nails removed surgically were examined histologically by Sagher (7), using frozen sections and hematoxylin & eosin and Van Gieson stains. He found definite differences in the mode of invasion by different organisms. Saprophytic fungi seemed to be located on the uppermost layers of the nail plate. *T. violaceum* invaded the superficial layers of the nail leaving the intermediate and deep portion of the nail plate free of fungal elements. *T. rubrum*, however, invaded the intermediate and deep layers of the nail leading to disruption of the nail structure. In some sections the fungi seemed to extend from deep processes of nail into the underlying tissue.

Sagher (11,14) dealt with the climatical and cultural aspects of Epidermophytosis (Athlete's Foot) in a book-chapter. He discusses the importance of the special climatic conditions of the Middle East.

Dostrovsky & Raubitschek (17, 17a) showed that recurring erysipelas of the lower extremity was not an -id reaction but a true erysipelas caused by hemolytic streptococci. They demonstrated a special technique for recovering the bacteria in the earliest stages of the disease.

Culture and Experiments

Sagher (4) analysed the results of routine cultures from 1,224 dermatologic patients during the years 1939—1946. Tinea capitis favosa was produced solely by *T. schoenleini*; although sometimes infection with *T. mentagrophytes* imitated both the clinical and the microscopical picture. Tinea capitis trichophytica was due to *T. violaceum* in 77 % of the patients; in the remaining cases the causing organisms were *T. mentagrophytes* and *T. tonsurans*. During routine examination of the families of children suffering from the "black-dot" type of Tinea capitis several adult females were found infected. Sycosis barbae profunda was rare. Tinea of the glabrous skin and Tinea pedis was most commonly due to *T. mentagrophytes*, closely followed by *T. rubrum*. *E. flocosum* was rarely encountered in cultures. The number of positive cultures from infected nails was disappointingly small.

RAUBITSCHEK & SAGHER (6) compared the results of culturing on Sabouraud's glucose slants and in hanging drop preparations from the same material. The latter method allowed earlier growth and therefore ealier identification of the organism.

RAUBITSCHEK (8) succeeded in increasing the yield of positive cultures from Tinea circinata by the use of a 5 % blood stock culture agar (Difco) instead of Sabouraud's medium. On the addition of antibiotics to Sabouraud's medium (9) earlier growth and faster development of primary isolates of dermatophytes, as compared to the growth without antibiotic addition, was noted. Stock strains of dermatophytes, however, when grown on this medium, containing different concentrations of antibiotics or none at all, showed no such differences in growth. These facts seemed to point to the importance of the dimorphism of the dermatophytes, there being apparently a physiological difference between the freshly isolated organism and the stock organism growing on laboratory media. In a large series of simultaneous routine cultures on identical media with and without the addition of antibiotics the yield of positive cultures was substantially larger on the antibiotic containing media. The antibiotics used in this series were penicillin, streptomycin and terramycin. Besides the inhibiting effect on bacterial contaminants the addition of the antibiotics had a direct enhancing effect on the pathogenic fungi, enabling earlier identification. It was concluded that the antibiotics speeded up the conversion of the fungi from the parasitic to the saprophytic phase (10, 12).

DOSTTROVSKY & RAUBITSCHEK (5) reported on a reciprocal inhibition of growth of various dermatophytes when two different organisms were grown on the same glucose agar plate. The inhibition which was temporary, occurred when the part of the colonies facing each other approached within a certain distance. The active principle causing the inhibition could not be demonstrated.

RAUBITSCHEK (18) grew various dermatophytes under continuous shake conditions in the form of small fuzzy balls. On microscopic examination the growth consisted only of hyphae with or without arthrospore formation and chlamydospores thus resembling the microscopic appearance of dermatophytes obtained directly from clinical lesions. He called this form the "pseudoparasitic phase" and showed that this phase could grow on an inorganic nitrogen source and could even fix and assimilate carbon from the atmosphere.

YEAST-LIKE FUNGI

A simple sugar fermentation method for the identification of various genera of *Candida* was described by RAUBITSCHEK (19). The apparatus consist of a small tube containing about 0.5 cc of an inoculated sugar solution and is sealed with a vaseline-paraffin mixture. A bent glass capillary, its lower end a few mm above the bottom of the tube, leads through the seal, and through it the pressure of the formed CO_2 expels the liquid to the outside. Thus a rapid and exact evaluation of the results of fermentation of various sugars can be achieved. From 54 cases of erosio interdigitalis and paronychia, *Candida albicans* was isolated in 82 % by RAUBITSCHEK (20). Experimental inoculation of freshly isolated culture material into the webs between the third and fourth and the fourth and fifth fingers of the hand produced typical erosio interdigitalis only in the case of *Candida albicans.* Other *candida* species and a strain of *Saccharomyces* resulted only in traumatic lesions. In a few cases, however, *Candida tropicalis,* imitated the results obtained with *Candida albicans.* All the lesions, however, healed spontaneously after various intervals in contrast to the naturally occurring erosio interdigitalis. Inoculations with *Candida albicans* on the forearm or thigh resulted in a dermatitis which healed spontaneously after 3—4 weeks. All other organisms produced the same lesions as simple scarification alone. It was concluded therefore that the pathogenicity of *Candida albicans* is very low and that the appearance of clinical moniliasis required besides the presence of the fungi, some additional factors peculiar to the host organism. The difficulty of evaluating the isolation of *Candida albicans* from various localizations in 460 cases is discussed by RAUBITSCHEK (21). The recovery of *Candida albicans* from the vaginae of pregnant and non pregnant women with and without clinical signs of vaginitis were investigated by BROMBERG, BRZEZINSKI & RAUBITSCHEK (22). Reasons for the development of clinical symptoms in women harbouring *Candida albicans* in the vagina were discussed. It was concluded that besides diabetes and pregnancy local injury and anatomic lesions of the vagina favour their appearance. In 4 healthy *Candida albicans* carriers no clinical vaginitis could be elicited by general and/or local use of sex hormones though the respective cytologic changes were induced by these compounds. However, introduction of foreign bodies, such as a pessary, into the vagina resulted in the appearance of mycotic vaginitis in 3 *Candida albicans* carriers. In no case of Candida albicans vaginitis could the fungi be recovered from the uterine cavity. ASCHER (23) described pulmonary moniliasis in 2 brothers. EFRAIM (24) reported on an ulcerative type of moniliasis on the tongue and lips of a 71 years' old man, who also developed a micropapular moniliid on the trunk. Gentian violet application plus vitamin therapy lead to regression of all the lesions.

DEEP MYCOSES

Two cases of torula meningitis were reported from the same hospital. NASSAU (25) described a 12 days old baby with various CNS disturbances and a papulo-macular rash on the skin of the trunk. Multiple abscesses of the skin developed in the late stages of the disease. The cerebrospinal fluid showed elevated protein, a raised cell count and normal sodium chloride values. The fungus, isolated repeatedly from both the liquor and the abscesses, was identified as *Torula histolytica.* The infant died in the sixth week of the disease and the post mortem confirmed the diagnosis of torula meningitis. BRANDSTAETTER'S & LEVITUS' (26) case was that of a 68 year old man who suffered from severe headache, low grade pyrexia and stiffness of the neck, and who later developed psychotic disturbances. The patient became increasingly apathetic and died on the 102nd day of his disease. The cerebrospinal fluid showed an elevated cell count with high protein values. *T. histolytica* was repeatedly grown from the liquor and from the urine during the later stages of the disease. The post mortem showed a typical torula meningitis.

MAGER & ASCHNER (27) found that organisms belonging to the genus *Torulopsis* formed a starch in their capsular substance which gave a dark blue colour on the addition of Lugol solution to the growing colonies. In subsequent studies on the nature and production of the starch in a large number of yeast-like organisms (28, 29) the authors concluded that an organism growing at 37° C and producing starch in its capsule could be identified as *T. histolytica.* ASHBEL (30) succeeded in infecting golden hamsters with *C. neoformans.* The organism was derived from a case of torula meningitis occurring among the military personnel stationed in Palestine during World War II. She described the different lesions and course of the disease in the hamsters following different routes of infection. It was noted that the addition of penicillin to cultures of the fungus enhanced its growth.

MYCETOMA

A case of black grain mycetoma in a Yemenite was described by DOSTROVSKY & SAGHER (31). The fungus, belonging to the genus *Madurella,* survived only a small number of transfers on various media. The disease proved resistant to sulphonamides and to penicillin (32), and the leg of the patient had to be amputated to stop the spread of the disease. The bones of the leg showed numerous. foci of destruction, with embedded black grains. In another case (33) of black grain mycetoma in a Yemenite the organism, a *Madurella* species, proved to be sensitive to sulphadiazine in vitro. Surgical debridement and prolonged sulphadiazine therapy led to complete cure of the patient. Four cases of yellow grain mycetomas were described by ZIPRKOVSKI a.o. (34). From two of them *Nocardia madurae* and from one *Streptomyces somalensis* were isolated. All the organisms were sensitive in vitro to tetracycline and the *Nocardia* strains to streptomycin as well. The patients were cured by antibiotic therapy without surgical intervention. All the cultures from the fourth patient were sterile.

ANTIMYCOTIC ANTIBIOTICS

RAUBITSCHEK & DOSTROVSKY (35) isolated a *B. subtilis* strain from the skin of a patient, which inhibited a number of dermatophytes. The antimycotic principle was secreted into the broth on which the organism grew. Extracts from the active broth of high potency in vitro were prepared. RAUBITSCHEK & DORI (36) screened 40 strains of Streptomycetes which were isolated from various soil samples for antimycotic activity. From soil (37) collected on Mount Herzl in Jerusalem a streptomycete was grown which produced a potent antibiotic substance active against *Candida* and *Cryptococcus neoformans*. Crude solid water soluble preparations were fairly non-toxic to laboratory animals, protected them against experimental moniliasis, and showed promising results in the treatment of human moniliasis.

Bibliography

1. DOSTROVSKY, A.: (1927.) Zur Thalliumbehandlung der Haarpilzerkrankungen der Kinder; Derm. W. schr. **84:** 729—732.

1a. DOSTROVSKY, A.: (1927.) The Thallium in the Treatment of Trichophytia capitis; Harefuah **2:** 111 (Hebrew).

2. KAPLAN, A. & RAUBITSCHEK, F.: (1946.) Kerion Celsi due to infection with T. schoenleini; Dermatologica **93:** 110—112.

3. DOSTROVSKY, A., SAGHER, F. & RAUBITSCHEK, F.: (1947). The Role of the Nail in Dermatophytosis; Harefuah **33:** 30 (Hebrew).

4. SAGHER, F.: (1947.) Laboratory Aspects of Fungous Diseases of the Skin and Hair; Acta Med. Orient. **6:** 68—78.

5. DOSTROVSKY, A. & RAUBITSCHEK, F.: (1947.) In Vitro Studies on a Reciprocal Growth Inhibition Exhibited by Certain Dermatophytes; Dermatologica **94:** 231—236.

6. RAUBITSCHEK, F. & SAGHER, F.: (1948) Hanging Drop Preparation as a Routine Method for Culturing Material from Fungous Disease; Acta Med. Orient. **7:** 213—216.

7. SAGHER, F.: (1948) Histologic Examinations of Fungous Infections of the Nails; J. Invest. Dermat. **11:** 337—354.

8. RAUBITSCHEK, F.: (1951) The Use of Blood-agar for the Primary Isolation of Dermatophytes; Mycopath. et Mycol. Appl. **6:** 15—18.

9. RAUBITSCHEK, F.: (1952) Problems of Dimorphism in Dermatophytes. Bull. Res. Council Israel **2:** 216.

10. RAUBITSCHEK, F.: (1953) Antibiotics and their Action on Pathogenic Fungi. I; J. Invest. Dermat. **20:** 401—403.

11. SAGHER, F.: (1953) Epidermophytosis (Athlete's Foot). Handbook of Tropical Dermat. Vol. II, Ed. by R. D. G. Ph. Simons, Elsevier Publishing Co., Amsterdam.

12. RAUBITSCHEK, F.: (1954) Antibiotics and Their Action on Pathogenic Fungi. II; J. Invest. Dermat. **22:** 359—361.

13. RAUBITSCHEK, F.: (1954) Family Epidemic of Tinea Capitis, Cutis Glabrosa and Unguium Caused by Trichophyton Megnini (Blanchard) 1896; Dermatologica **109:** 25—30.

14. SAGHER, F.: (1954) Epidermophytosis (Athlete's Foot). Medical Mycology. Ed. by R. D. G. Ph. Simons. Elsevier Publishing Co., Amsterdam.

15. DOSTROVSKY, A., KALLNER, G., RAUBITSCHEK, F. & SAGHER, F.: (1955) Tinea Capitis. An Epidemiologic, Therapeutic and Laboratory Investigation of 6,390 Cases; J. Invest. Dermat. **24:** 195—200.

16. BERLIN, CH. & MEYROVITZ, C.(1955) The Management of Tinea Capitis. Report on 1,877 Treated Cases; Brit. J. Dermat. **67:** 397—401.

17. Dostrovsky, A. & Raubitschek, F.: (1955) Recurring Erysipleas of the Lower Extremities and its Relation to Tinea Pedis; Dermatologica **111:** 14—20

17a. Dostrovsky, A. & Raubitschek, F.: (1956) Tinea Pedis and Recurring Erysipelas; Harefuah **50:** 1—3 (Hebrew).

18. Raubitschek, F.: (1955) Nutritional Requirements of Dermatophytes in Continuous Shake Culture; J. Invest. Dermat. **25:** 83—87.

19. Raubitschek, F.: (1945) A New Fermentation Method for Mycological Identification; J. Bact. **50:** 337—339.

20. Raubitschek, F.: (1946) The Role of Candida Albicans in the Production of Erosio Interdigitalis and Paronychia; Dermatologica **93:** 295—306.

21. Raubitschek, F.: (1947) The Problems of Moniliasis; Acta Med. Orient. **6:** 85—90.

22. Bromberg, Y. M., Brzezinski, A. & Raubitschek, F.: (1951) Moniliasis of the Female Genital Tract; Exp. Med. Surg. **9:** 79—89.

23. Ascher, L.: (1944) Two Cases of Pulmonary Blastomycosis in Brothers; Harefuah **27:** 124—125 (Hebrew).

24. Efraim, H.: (1949) Chronic Deep Monilia Albicans Infection of the Mucous Membrane of the Mouth; Brit. J. Dermat. **61:** 414—416.

25. Nassau, A. & Weinberg-Heruti, Ch.: (1948) Torulosis in an Infant; Harefuah **35:** 3 (Hebrew).

26. Brandstaetter, S. & Levitus, A.: (1948) Torula Meningitis; Harefuah **35:** 1—2 (Hebrew).

27. Mager, J. & Aschner, M.: (1946) Starch Reaction as Aid in Identification of Causative Agent of "European Blastomycosis"; Proc. Soc. Exp. Biol. Med. **62:** 71—72.

28. Mager, J. & Aschner, M.: (1947) Biological Studies on Capsulated Yeasts; J. Bact. **53:** 283—295.

29. Mager, J.: (1947) Studies on the Polysaccharides of Capsulated Yeasts; Biochem. J. **41:** 603—609.

30. Ashbel, R.: (1955) Sixty Years of the Pathogen Yeast Cryptococcus Neoformans (Sanfelice) Vuillemin (Torula Histolytica); Harefuah **49:** 1—5 (Hebrew).

31. Dostrovsky, A. & Sagher, F.: (1942) Madura Foot in Israel; Harefuah **23:** 1—4 (Hebrew).

32. Dostrovsky, A. & Sagher, F.: (1948) Failure of Sulphonamides and Penicillin in Maduramycosis; Lancet **1:** 177—178 (January 31).

33. Dostrovsky, A., Sagher, F. & Raubitschek, F.: (1952) Maduramycosis of the Foot by a Madurella Species; Dermatologica **104:** 415.

34. Ziprkovski, L., Altmann, G., Dalith, F. & Spitz, U.: (1957) Mycetoma Pedis. — Four Cases Treated with Streptomycin; A. M. A. Arch. Dermat. **75:** 855—863.

35. Raubitschek, F. & Dostrovsky, A.: (1950) An Antibiotic derived from B. Subtilis active against Dermatophytes; Dermatologica **100:** 45—49.

36. Raubitschek, F. & Dori, E.: (1955) Antimycotic Activity of Streptomycetes Isolated from Local Soil; Bull. Res. Council Israel **5B:** 148—150.

37. Raubitschek, F.: (1957) An Antibiotic Substance Produced by a Local Streptomyces Active Against Candida and Cryptococcus; Harefuah **52:** 6—7 (Hebrew).

EDOUARD-JEAN GILBERT
(1888—1954)

IN MEMORIAM

EDOUARD-JEAN GILBERT

(1888—1954)

La mort de M. Edouard-Jean Gilbert, en mars 1954, a privé la Mycologie française d'un de ses animateurs les plus originaux. Né en 1888 à Saint-Yorre (Allier), docteur en pharmacie, Gilbert avait fait toute la guerre de 1914—1918 au front, d'abord comme brancardier, ensuite comme pharmacien auxiliaire. C'est aux armées qu'ayant rencontré le mycologue Louis Maire, il se mit à l'étude des champignons qui devait occuper toute sa vie.

E.-J. Gilbert se signala d'abord à l'attention des mycologues par d'énergiques recommandations sur la façon de présenter des descriptions et des figures des espèces. Il protestait contre le fait que beaucoup d'auteurs de flores ou d'atlas empruntaient leurs diagnoses à leurs prédécesseurs, principalement à Fries et il écrivait: ,,J'aimerais les voir faire, d'après nature, une étude descriptive aussi complète que possible, sans le secours des auteurs et avant même de les lire''. Les mycologues contemporains ont pour la plupart suivi ce conseil. Chose curieuse, Gilbert, quant à lui, répugnait à la multiplication des espèces nouvelles, et il en a publié très peu. Il s'employa au contraire à démontrer l'inanité de nombreux binômes et cette tendance l'entraîna sans doute trop loin. Pourtant, en encourageant des observations personnelles plus soigneuses, il amenait ses confrères à séparer bien des espèces jusqu'alors confondues.

Gilbert avait voulu codifier ses recommandations, dont beaucoup étaient excellentes, dans une série d'ouvrages: *La spore des champignons supérieurs* (1927), celui de ses livres qui a sans doute le plus vieilli; *La Mycologie sur le terrain* (1928), qui précise utilement quantité de détails à observer, notamment sur l'habitat des champignons; *Méthode de Mycologie descriptive* (1934), qui reste valable au moins pour les descriptions macroscopiques. Entre temps, il avait publié *Les Bolets* (1931) avec les dessins du contour des spores, et où la valeur des espèces est discutée en détail, avec un esprit critique souvent remarquable. Cependant là encore, Gilbert était amené à aller un peu loin en contestant l'existence de certaines espèces.

Le principal travail d'E.-J. Gilbert restera celui qu'il a consacré aux Amanites du monde entier, dont il était un spécialiste universellement reconnu. Ce travail a été publié comme suite et volume XXVII de l' *Iconographia mycologica* de Bresadola (*Amanitaceae*, Milan, 1940-1941).

Il faudrait naturellement citer les très nombreuses notes qu'il a publiées dans le Bulletin de la Société Mycologique de France, principalement sur les Amanites et sur les Bolets. On lui doit aussi un Essai sur la terminologie des organes véliformes et annuliformes des Agaricales et Bolétales, où il a attiré l'attention sur la nature et l'origine de ces organes, très différents selon les groupes et les espèces. Enfin citons des biographies de mycologues français: H. BOURDOT, L. JOACHIM, L. QUÉLET, BULLIARD.

E.-J. GILBERT faisait servir tous les documents, et notamment les correspondances privées des mycologues, à l'éclaircissement de questions douteuses en Mycologie. C'est ainsi qu'il avait cherché à retrouver toutes les espèces décrites par le mycologue niçois BARLA. Une anecdote amusante montre tout le soin qu'il apportait à ses enquêtes. N'ayant pu trouver nombre d'espèces sur les stations indiquées dans les notes de BARLA, il retrouva un des collecteurs du mycologue, rétribué par lui pour aller lui chercher des champignons. Et il put lui faire avouer que presque tous les échantillons décrits par BARLA provenaient d'une seule station, très riche, proche d'un village voisin de Nice où le collecteur avait une maison et résidait sans frais.

EDOUARD-JEAN GILBERT avait été président de la Société Mycologique de France de 1937 à 1940. Il avait reçu en 1951 le prix Montagne de l'Académie des Sciences de Paris pour son oeuvre en Histoire naturelle.

Qu'il me soit permis de terminer ces quelques lignes sur une note personnelle. E.-J. GILBERT fut pour moi un maître dont j'ai toujours admiré la scrupuleuse honnêteté scientifique, mais aussi un ami dont j'évoque la sympathie avec un vif regret.

PAUL OSTOYA

Secrétaire général
de la Société Mycologique de France.

LIBRI NOVI

Locquin, Marcel: *Petite Flore des Champignons de France*, Tom. 1. Agarics, Bolets, Clavaires. pp. 382. Published by the Author, Paris. 1956. Paper. (French).

This is a very ambitious work, well printed and bound, designed to familiarize the student of fleshy fungi with those gilled, tubular and coralloid mushrooms which are known to occur in France. More than that, it is designed as a guide to the edibility of the various species which are listed.

From the start it is obvious that the author wishes to guard his readers against poisoning themselves with the fruits of their mushroom collecting. The several types of mushroom poisoning are described in detail. Symptoms, causal mushrooms and treatment are given for phalloid, atropinoid, sudoral, gastrointestinal, hemolytic, cardiovascular and mixed types of poisoning.

A chapter is devoted to the culture of the common mushroom, *Agaricus bisporus*.

The structures for which to look in the correct identification of mushrooms according to the keys in the main part of the book are described in detail. The microscopic and photographic techniques of studying mushrooms are well illustrated and described. In addition to an extensive glossary, a list of descriptive adjectives is given for each structure of the fungus fruit body. Twenty-threepages are devoted to an extensive discussion and description of color as it is found in the mushroom. Since color is a very important character in mushroom identification, and since many colors have many synonyms or are described differently by each student of mushrooms, this section is very valuable. Two very unusual chapters are devoted to a listing and description of the terms used in describing the odor and flavor of mushrooms. Lists are given of species to which each flavor or odor is attributed. This section is more brief than that on color because the terminology of odors and flavors is as yet poorly developed.

The glossaries and keys are well illustrated with 28 plates on which 1000 line-drawings of mushroom structures are presented.

Keys are given for the classes, families, genera and species of fleshy fungi. The system used is commonly referred to as the "French" system, but it will not be unfamiliar to the users of the system found in Singer's text on the "*Agaricales* (*Mushrooms*) *in Modern Taxomony*". Three families of the Aphyllophorales and eleven families of the Agaricales include all the fleshy fungi considered in this work.

In the keys to 1035 species of fleshy fungi an occasional note in bold face type, "Toxique", warns the collector to beware of this species. Edible species are indicated by crossed forks: one pair for fair, two for good, and three for excellent. Where no edibility factors are indicated, the mushroom is woody, leathery, tough, or not especially tasty for eating purposes.

The volume is concluded with a 53-page guide to the culinary adaptability of the fleshy fungi. One hundred of the best edible mushrooms are tabulated according to their usefulness with vegetables, as condiments, in salads, in sauces, as coloring agents, in soups, as garnishes, with eggs, with wines, with meat, with poultry, with mollusks and crustaceans, and as desserts. The mushrooms which would be best for use in each of 118 recipes are listed after the detailed instructions for preparation.

A special warning is in order. Many of the species listed in this volume occur in other parts of the world where they are known under other names. In some places, and especially in the United States, the nomenclature and taxonomy of the fleshy fungi are still poorly known. Edibility data in the book should be taken as valid for France and for nomenclatural equivalents of the listed species elsewhere, but outside the geographic area specifically covered by the book as well as within it, the mycophagist should heed these warnings: "Les champignons sont éphémères et il faut voir et revoir cent fois la même espèce sous ses formes diverses pour être sûr de la connaître." And: "Si vous n'êtes pas mycologue et si vous ne voulez pas le devenir, confiez la détermination de vos champignons à un office spécialisé ou abstenez-vous de les cueillir."

Robert A. Taft Sanitary Engineering Center

WM. BRIDGE COOKE

R. CIFERRI: *G. Lindau and P. Sydow's Thesaurus Literatura Mycologicae et Lichenologicae, Supplementum,* 1911—1930, Vol. 1, A-D, pp. 689. Renzo Cortina, Pavia, Italy.

The first five volumes of LINDAU and SYDOW'S *Thesaurus* covered most mycological literature published up to 1910. The need for later supplements to this comprehensive bibliographic compilation has not been expressed until recently. In the meantime the first five volumes of the *Thesaurus* have been made available through a photolith reprint and a microcard reproduction.

During the years he has been at the University of Pavia, Dr. R. CIFERRI has accumulated an extensive reference index to the mycological literature of the world. This, supplemented by additional references from *Biological Abstracts, Review of Applied Mycology, Experiment Station Record, Bibliographie der Pflanzenschutzliteratur,* and other sources, formed the basis for the present Supplement.

The first volume of the Supplement includes only references by authors A-D. It is arranged alphabetically by author and chronologically for each author with more than one citation. The type is that of a block letter Veritypewriter. It is well spaced which aids clarity as well as adds to the length of the book. The number of references cited is 7167. Titles from journals which do not use Roman letters have been transliterated. Typographical errors appear to have been reduced to a minimum.

The person requiring quick access to the world literature of mycology, including medical and veterinary mycology, fungi associated with insects, plant pathology, fungi in relation to industry and fermentation processes, and systematics, physiology and biochemistry of fungi, will find this a handy reference series. It will be of interest to learn whether subject cross reference indices will be provided.

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

WM. BRIDGE COOKE

COLOR ATLAS OF SKIN DISEASES, edited by HARADA, KITAMURA, MIURA, NAKAGAWA, TAKAHASHI, YOKOYAMA. Illustrated with 200 plates in full color, in two volumes, bound in gold-stamped buckram, 9.5 cm by 12.5 cm. Price of two volumes U.S. $ 60.— Kanehara Shuppan Co., Ltd. Tokyo, Japan, 1956 (English edition).

This Atlas featuring 200 large, magnificent, full-color plates of the diseases of the skin and the accessible mucous membranes, was first presented to the Western World at the XI. International Convention of Dermatology at Stockholm, Sweden, in 1957. The Japanese original of this Atlas is a product of collaboration of Japanese dermatologists. Its material has been selected from over 2,500 color slides offered by 31 dermatological clinics in Japan.

The presentation of skin diseases in this color Atlas is unique. We had several, different editions of color atlases of skin diseases in German and in French in the Western World. They were more often than not color reproduction of painted moulages or water colors like EHRMANN'S famous atlas. How excellent they may have been, there was always something dead, unreal in their presentation. Moreover, this reviewer always had the impression that those presentations were excellent for those who already knew dermatology, but not for the inexperienced student who mostly was not able to diagnose the skin disease in vivo, after having seen the reproduction of a — otherwise — fine moulage. In this respect, this Japanese Atlas is unique, indeed. The plates are reproductions of color photographs taken from the living skin. They are alive in their color, in the surface structure of the skin, bringing the finest shades and hues of the normal skin and the diseased surface. Seeing these pictures, anyone could diagnose the respective skin ailment in vivo, without any difficulty. The material of this Atlas is universal as far as the skin diseases are concerned, thus usable all over the world. There are also a few syndromes presented which have been described the first time by Japanese authors or occurring only in Japan; e.g. acropigmentatio reticularis (KITAMURA); dischromatosis hereditaria (TÔYAMA); nevus fusco-ceruleus ophthalmo-maxillaris (ÔTA). The color rendition is masterly throughout. The reviewer wants to mention only a few color plates in which the difficult colors are superb, like in morbus Raynaud (II, 12); scleroderma diffusum (II, 33); melanosis Riehl (II, 37). There are two magnificent reproductions of tattooing of the skin made with the highest skill of Oriental art and craftmanship. There is an excellent picture of "yellow moth dermatitis", common in Japan. This dermatitis is similar to that caused by the brown tailed moth (*Euproctis Crysorrhea* LINNAEUS) and the gypsy moth (*Liparis Dispar* LINNAEUS) in the United States.

Every color plate of this edition carries a clear, concise explanatory text in English from the pen of Professor IZAKI of the Iwate Medical College. The text was reviewed by Lt. Col. E. S. HALLINGER, Jr., MC., Chief of Dermatology Service at the U.S. Army Hospital in Tokyo. These descriptions cover a short history of the case, the course of the disease, and where it was indicated, even the therapy is mentioned. A few clinical pictures are also represented in addition, in full colored histological sections, e.g. Darier's disease (I, 35); lymphangioma circumscriptum (I, 66). There are also a number of color plates showing fungus infections of the scalp.

This Color Atlas of Skin Diseases is the highest tribute to Japanese Dermatology and also to the Japanese printing technique. It can be warmly recommended to both the younger and the older student of dermatology and to all those who love fine books. This is a bibliophile edition.

TIBOR BENEDEK

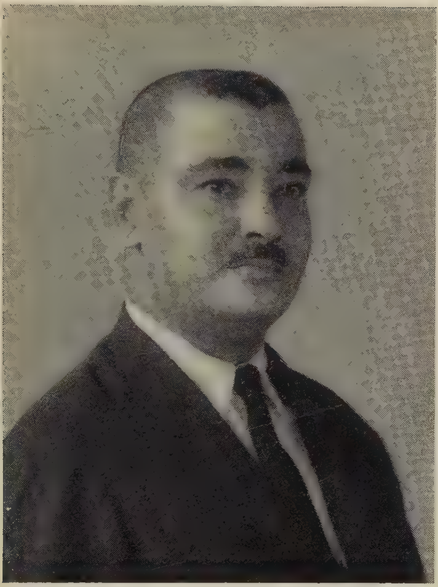
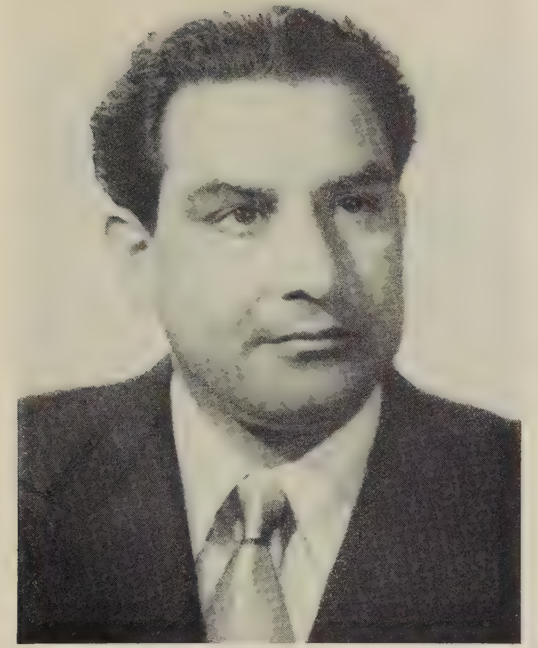


Photo Phil Schäfer

A. CHAVES BATISTA
Instituto de Micologia
Universidade do Recife, Brazil

Gallery of Contemporary Noted Mycologists
17



S. N. DASGUPTA

Department of Botany
Lucknow University, Lucknow, India

Gallery of Contemporary Noted Mycologists
18

Photo Merlin

R. MORQUER

Laboratoire de Botanique Appliquée
Université de Toulouse, France

Gallery of Contemporary Noted Mycologists

19

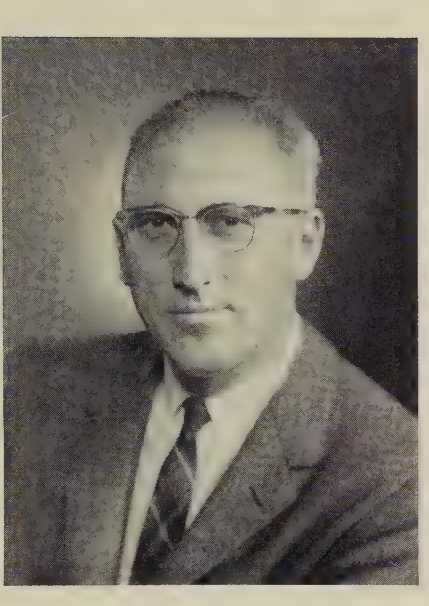


Photo Fabian Bachrach

EDWARD D. DELAMATER

Department of Physiology
The School of Medicine
University of Pennsylvania, Philadelphia, Pa., U.S.A.

Gallery of Contemporary Noted Mycologists

20

STUDIES OF CRYPTOCOCCUS NIGRICANS N. SP. I. IDENTIFICATION AND TAXONOMIC CLASSIFICATION [1]

MARVIN A. RICH [2] & ARTHUR M. STERN [3]

(*Department of Bacteriology Rutgers University New Brunswick, New Jersey*)

With 3 figures)

(29.III.1958)

Although the designation *black yeast* has been applied to a relatively wide variety of yeasts and yeast-like fungi, black pigmented species of the genus *Cryptococcus* have never been described. Characterization of an organism isolated from paint scrapings (taken from a gasoline storage tank) suggested that it was a heretofore undescribed, black pigmented species of this genus. This report deals with the description and taxonomic characterization of this organism, for which the name *Cryptococcus nigricans* is proposed.

Experimental Methods and Results

Stock cultures were maintained on slants of Sabouraud's dextrose agar (Difco) at 28° C. Where ever possible the methods recommended by LODDER & KREGER-VAN RIJ (1952), and WICKERHAM (1951), for the morphological and physiological characterization of yeasts, were employed.

Morphology. After 4 days on malt-extract agar (Difco), cells were oval to round, 5 to 7.5 μ in diameter. Reproduction was by multilateral budding. Capsules could be clearly demonstrated by the addition of india ink to wet mount preparations (figure 1).

Since ascospore and mycelial formation are of considerable taxonomic significance in separating the yeast-like fungi, the organism was cultivated on a wide variety of culture media reported to induce sporulation or mycelial formation. These included nutrient agar, nutrient broth, nutrient gelatin, dextrose broth, litmus milk, potato starch, carrot slices, starch agar, tributyrin agar, aesculin agar, blood agar, Sabauraud's dextrose agar, Wickerham's morphology agar, corn meal agar, tomato juice agar, high salt medium, Lindergren's presporulation medium, Wickerham's V-8 medium, Gorodakawa's medium, malt extract agar, and gypsum slants. During a three year period of cultivation neither ascospore not mycelial formation was ever observed. Similarly examination of old cultures (up to 22 months) and crushed cover slip preparations proved negative for ascospore or mycelial formation.

---

[1] This study was supported in part by a grant-in-aid, from the Rutgers Research Council.

[2] Present Address: Division of Biophysics
Sloan-Kettering Institute for Cancer Research
New York City, N. Y.

[3] Present Address: West Virginia Paper and Pulp Company
Covington, Virginia.

Colonial Morphology. Dalmau plates (WICKERHAM, 1951), and the slide culture method of RIVALIER & SEYDEL (1932) were employed for the characterization of colonial morphology. The most striking characteristic of this microorganism is its jet black coloration. Unlike many of the other *black-yeasts*, which are initally light or only slightly pigmented, and darken with age, the jet-black pigmentation of this organism is always evident.

Growth is initally in small, convex, glistening, discreet colonies which coalesce to form larger, raised colonies. These mucoid tar-like colonies become wrinkled and extremely tough with age (figure 2).

Growth in Liquid Medium. The growth in stationery cultures of Sabouraud-dextrose broth was slow, with the formation of discreet black particles and ring formation. This was followed by the formation of a thick (2-3 mm.), heavily wrinkled pellicle (figure 3). After 3 to 4 weeks, the medium beneath the pellicle developed a slimy, semi-solid consistency due to the formation of an ethanol precipitable poly-saccharide.

Fermentation. Fermentations (gas production) on a variety of sugars considered by BENHAM (1935) to be of taxonomic significance, were carried out according to the method of WICKERHAM (1951). The results may be seen in Table I.

TABLE I.

Fermentation and assimilation of carbohydrates by Cryptococcus Nigricans

Carbohydrate	Fermentation [1]	Assimilation (as sole carbon source)
Glucose	0	+
Galactose	0	0
Maltose	0	+
Sucrose	0	+
Lactose	0	0
Melibiose	0	0
Raffinose	0	0

Carbohydrate Assimilation. To determine the ability of this organism to assimilate various carbohydrates as sole carbon source, two methods were employed. A modification of the auxanographic method of LODDER (1934) employed sterile (12.7) mm filter paper discs, dipped into filtered solutions of the appropriate carbohydrates and aseptically transferred to seeded plates of carbon deficient medium. Identical results (Table I) were obtained with the liquid medium method of WICKERHAM & BURTON (1948), employing a chemically defined medium developed for this organism (RICH, 1957a).

---

[1] Gas production (observed at intervals up to 21 days).

Nitrate Assimilation. The ability of *Cryptococcus nigricans* to assimilate nitrate was demonstrated by its growth in a chemically defined medium which contained KNO_3 as the sole nitrogen source. The ability to reduce nitrate to nitrite, considered by some investigators (NICKERSON, 1944) to be superior to the direct assimilation test, also gave a positive result.[1])

Hydrolysis of Urea. The ability of this organism to rapidly split urea was demonstrated on Christensen's medium according to the method of SEELIGER (1956).

Pathogenicity. As pathogenicity for mice is an important diagnostic characteristic for certain of the *Cryptococci* (BENHAM, 1956), the virulence of this organism was determined. One half ml. of a saline suspension, standardized so as to contain 10^6 cells/ml., was injected intravenously into each of fifteen 20-25 g. mice. An identical group was inoculated intraperitoneally with 1 ml. of the same suspension.

Although exhibiting no signs of distress, animals were sacrificed after 7 and 14 days, and autopsied. Brain, kidney, blood, liver, and spleen cultures, prepared as previously described (RICH & STERN, 1957), in all cases proved negative, as did direct microscopic examination of excised and macerated organs.

Cryptococcus nigricans n. sp.

Post quattor dies in Sabouraud-glucoso, 28° C: cellulae aut ovate aut globosae, diametro 5 usque 7.5 μ. Nec vera nec pseudo-mycelia formantur. Novae cellulae se creant in multis lateribus gemmandae. Cellulae crassis capsulis circumdatae. Coloniae nigerrimae, mucosae; sensecunt, durae rugosaeque. In mediis fluentibus ut crassa pellicula iacent. Non muribus virulentus. Non accrescet, 37° C.

Discussion

The taxonomic classification and nomenclature of the asporogenous yeast-like fungi has been the subject of considerable controversy. This has been adequately discussed by BENHAM (1956) and LODDER & KREGER-VAN RIJ (1952), whose descriptions of the genus *Cryptococcus* have been generally accepted, and will not be discussed here.

---

[1]) Nitrate was reduced to nitrite, as measured by the sulfonilic acid-alpha napthylamine test (Manual of Methods for Pure Culture Study of Bacteria, 1952).

The inability of this organism to form ascospores or mycelia over a period of three years when continuously cultured on a wide variety of culture media, was of considerable taxonomic significance. The absence of mycelial development made remote the possibility that this was merely the transitory yeast phase of such dematiaceous molds as *Cladosporium* (*hormodendrum*), *Torula*, or *Dematium*.

The inability of the organism to produce ascospores placed it in the *Fungi imperfecti*, and the family *Cryptococcaceae*. (LODDER & VAN RIJ placed these asporogenous yeasts in a separate order, *Cryptococcales*). The absence of arthrospores, and yellow or red pigments indicated the subfamily *Cryptococcoideae*, while the shape of the cells, capsule formation, production of a polysaccharide, and its non-fermentative character, prescribed the genus *Cryptococcus*.

TABLE II.

Characteristics of Cryptococcus nigricans N. Sp. [1]) *and* BENHAM'S *Groups I and II Cryptococci*

Organism	Growth at 37^0 C	Path. for mice	KNO_3 Assimilation	NO_3 to NO_2	Carbon Assimilation Glucose	Maltose	Sucrose	Lactose	Galac tose
BENHAM'S [1]) group I									
Cryptococcus neoformans	+	+	0	0	+	+	+	0	+
Cryptococcus nigricans n. sp.	0	0	+	+	+	+	+	0	0
BENHAM'S [1]) group II									
Cryptococcus albidus	0	0	+	+	+	+	+	0	0
Cryptococcus diffluens	0	0	+	+	+	+	+	0	0
Cryptococcus neoformans var, *innocuus*	0	0	+	+	+	+	+	0	0

[1]) Data from BENHAM (1956).

BENHAM (1956) has divided the *Cryptococci* into three groups. As can be seen from Table II, the organism described can clearly be placed in Group II. The striking jet-black pigmentation, as well as the wrinkled growth of this organism, sharply differentiate it from the other members of this group, i. e. *Cryptococcus albidus*, *C. diffluens*, and *C. neoformans* var. *innocuus*, which have been described as, respectively, cream to yellowish-brown, yellow, and cream to orange-tan. Consequently a new species, *Cryptococcus nigricans* is proposed.

---

[1]) A culture has been deposited in the American Type Culture Collection, Washington, D.C.

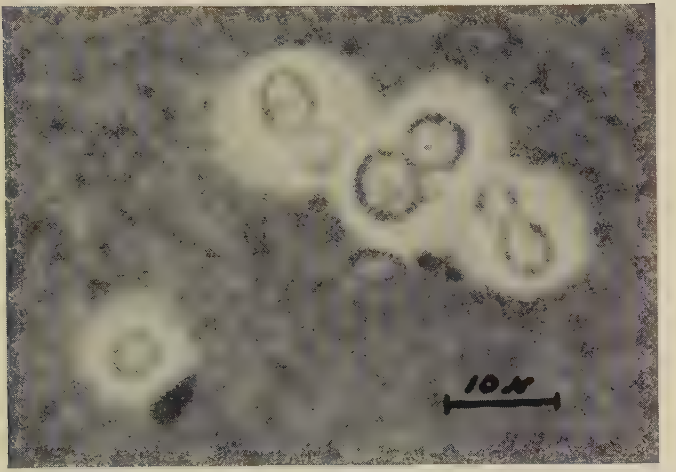


Fig. 1. India ink preparation of *Cryptococcus nigricans*, demonstrating the presence of capsules. Cells grown on Sabouraud-dextrose agar; 3 days. 1470 X.

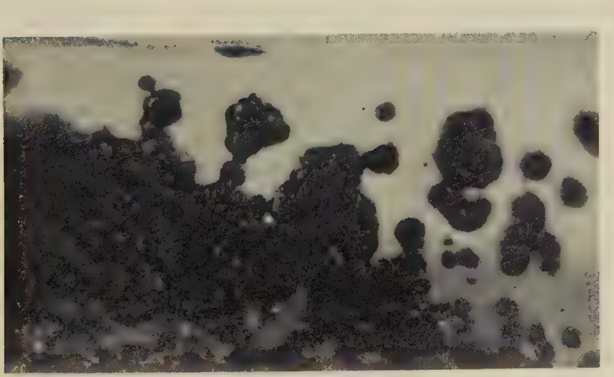


Fig. 2. Growth of *Cryptococcus nigricans* on Sabouraud-dextrose agar; 6 days. 1.7 X

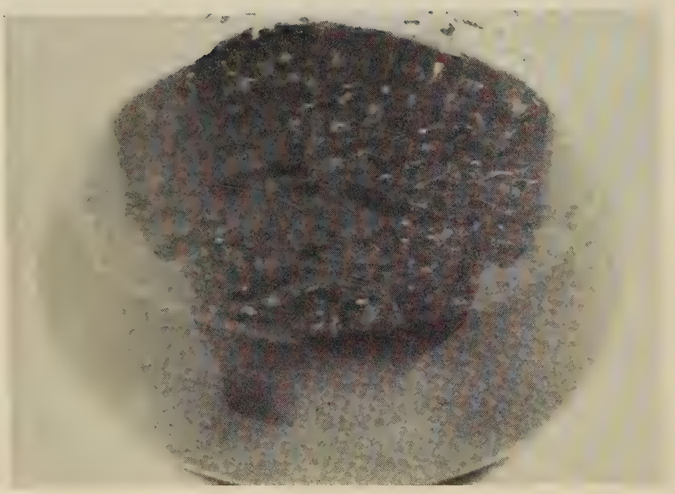


Fig. 3. Growth of *Cryptococcus nigricans* in stationary, liquid culture (Sabouraud-dextrose broth); 3 weeks. The heavy wrinkled pellicle can be seen.

Acknowledgements

The authors are indebted to Dr. SHIRLEY SMITH, of Douglas College, for the Latin diagnosis; and to Dr. CONRAD HAENSELER, of the Plant Pathology Dept., Rutgers University, for his helpful suggestions.

Summary

An asporogenous, non-filamentous, black pigmented yeast-like fungus, isolated from paint scrapings, was characterized and identified as a heretofore undescribed species of the genus *Cryptococcus*. Because of its jet-black pigmentation, the name *Cryptococcus nigricans* was proposed.

Bibliography

BENHAM, R. W. (1935) Trans. N. Y. Acad. Sci. **57,** 255—274.

BENHAM, R. W. (1956) Bact. Rev., **20,** 189—200.

GRAHAM, V. E. & HASTINGS, E. (1941) Canad. J. Res. C; **19,** 251—256.

LINDERGREN, C. C. & LINDERGREN, G. (1944) Bot. Gaz. **105,** 304—316.

LODDER, J. (1934) Verhandel. Koninkl. A. Acad. Wetenschap. Amsterdam, Afdeel. Natuurk. T. W. Sectie, Ed **32,** 1—256.

LODDER, J. & KREGER-VAN RIJ, N. J. W. (1952) Yeasts: A Taxonomic Study. Interscience Publishers, Inc., New York.

NICKERSON, W. J. (1944) Mycologia, **36,** 224—233.

RICH, M. A. & STERN, A. M. (1957) Canad. J. Microbiol. **3,** 607—610.

RICH, M. A. (1957a) Studies on *Cryptococcus nigricans* and other black yeasts. Ph. D. thesis, Rutgers University, New Brunswick, N. J.

RIVALIER, E. & SEYDEL, S. (1932) Ann. Parasit. hum. comp., **10,** 442—452.

SEELIGER, H. P. R. (1956) J. Bact. **72,** 127—131.

Society of American Bacteriologists, Committee on Bacteriological Techniques, 1942 Manual of Methods for the Pure Culture Study of Bacteria. Leaflet VI, 9th ed. Biotech. Publications, Geneva, New York.

WICKERHAM, L. J. (1951) Taxonomy of Yeasts. U. S. D. A. Technical Bulletin No. 1029. Washington, D. C.

WICKERHAM, L. J. & BURTON, K. A. (1948) J. Bact. **56,** 363—371.

WICKERHAM, L. J., FLICKENGER, M. H. & BURTON, K. A. (1946) J. Bact. **52,** 611-12.

A PARASITIC SPECIES OF PERICONIA FROM INDIA

by

S. T. Tilak

(*M. A. C. S. Laboratory, Law College Buildings, POONA-4* (*India*).

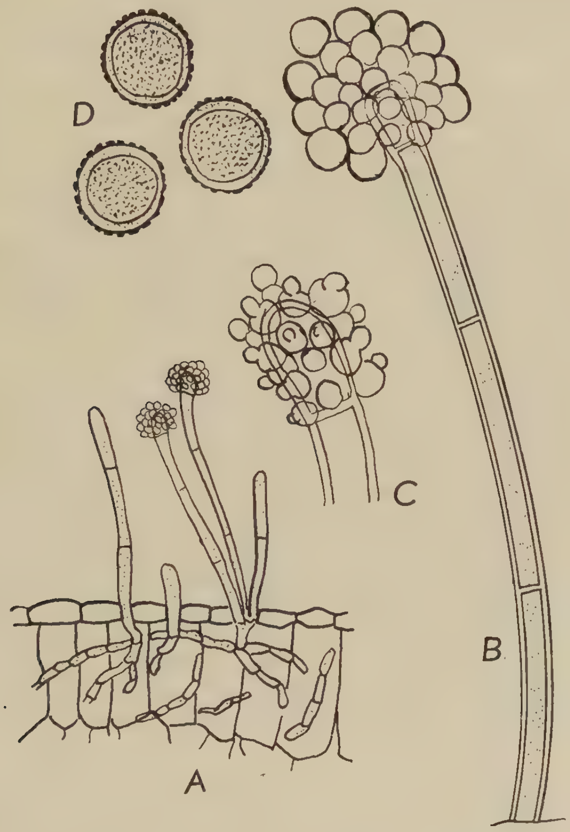
(26.XII.1957)

The fungus genus *Periconia*, remained unrepresented in the Indian flora until Sultan Ahamad (1949) described *Periconia pycnospora* from Lahore. Recently Subramanian (1955) has described several species from South India. Earlier Saccardo lists about 26 species of this genus. Although the genus is typically saprophytic, J. A. Stevenson & E. P. Imale (1945) have reported a parasitic species *P. citharexyli* Henn. as causing a severe blight of rubber plant in Hawaii. The writer collected a *Periconia* from *Desmodium laxiflorum* DC. causing blight and defoliation of the living host. These considerations aroused interest and led to a critical study of the fungus, which on casual examination appeared to resemble *P. byssoides* described by Subramanian (1955). On a closer comparison, however, the Poona fungus was found to have several characteristics which distinguished it sharply from *P. byssoides* and other species, as can be seen from the following table:

TABLE I.

Species	Conidiophores	Arrangement of sporogenous cells	Conidia	Habit	Authority
P. pycnospora	200—300 X 10—14 μ	Fertile head continuous with conidiophore	Verrucose 12—17 μ	Saprophytic Ectophytic	Saccardo
P. byssoides	8-septate upto 420 μ	Fertile head distinct with septa sporogenous cells on both sides of the septum	Verrucose 9—15 μ	Saprophytic Ectophytic	Subramanian (1955)
Poona species	4-septate 280—370 μ	Fertile head distinct-Sporogenous cells only above the septum	Verrucose 10—15 μ	Parasitic Endophytic	—

It is clear from a critical examination of the table that the Poona *Periconia* is distinct from the other species in respect of septation and emergence of conidiophores, arrangement of the sporogenous cells around the fertile head. Besides, this fungus has parasitic habit causing blight and defoliation, unlike most species so far described. As the Poona *Periconia* has morphological features quite distinct from the species described so far, it is proposed to present it as a new species of *Periconia* with Latin diagnosis.



A. Emergence of conidiophores through the host (X 360).
B. Conidiophores with whorls of conidia (X 360).
C. Fertile head showing arrangement of sporogenous cells (X 700).
D. Conidia (X 1560).

Periconia parasitica Tilak sp. nov.

Infectionis maculae hypophyllae, uniformiter effusae, brunneae, irregulares, marginibus fusce brunneis. Areae necroticae irregulariter fissae robiginem atque defoliationem producentes.

Conidiophori recti vel tenuiter curvati, duplici pariete prorsus ornati, 4-septati, capitulo fertili distincto separato per septum, pallide brunnei vel brunnei, $280 - 370 \times 17 - 34\ \mu$, emergentes fasciculati bini ad quinos per epidermidem. Cellulae sporogenae dispositae circum capitulum fertile supra septum, nullae infra.

Conidia catenulata, acropeta, hyalina initio, brunnea ad maturitatem, globularia, verrucosa, 10 — 15 μ.

Parasita planta *Desmodii laxiflori* DC. producens robiginem atque defoliationem.

Lecta a TILAK, in urbe Poona, in India, mense septembri anni 1957.

Besides, being a new species, the genus is a new addition to the Bombay flora.

The type specimens have been deposited at the Herbaria of the Commonwealth Mycological Institute, Kew, England and Indian Agricultural Research Institute, New Delhi, India.

The writer is grateful to Prof. M. N. KAMAT for guidance and to Dr. S. P. AGHARKAR for facilities offered at the M. A. C. S. Laboratory. He is also thankful to Rev. Father H. SANTAPAU for Latin diagnosis.

References

LINDER, DAVID H. (1937) New Venezuelan Fungi Imperfecti; Mycologia, **29**: 656—664.

SACCARDO, P. A. (1905) Sylloge Fungorum.

STEVENSON, J. A. & E. P. IMALE (1945) Periconia blight of Heavea; Mycologia, **37**: 576—581.

SUBRAMANIAN, C. V. (1955) Some species of Periconia from India; J. Ind. Bot. Soc. **34**: 339—361.

SULTAN AHAMAD (1949) Addition to the Fungus Flora of Pakistan & India. Ind. Phytopath. **2**: 11—16.

AFFINITY BETWEEN FUNGI OF THE VERRUCOUS DERMATITIS AND SOOTY-MOLDS

R. Ciferri

Centro di Micologia Medica "Piero Redaelli", Istituto Botanico dell'Università di Pavia, Italia

(5.II.1958)

Revising the fungi of so called verrucous dermatitis (or chromomycosis or chromoblastomycosis) since the year 1942, we (Redaelli & Ciferri) called the attention to the similarity with the group of imperfect sooty-mold fungi (Capnodiaceae family or Capnodiales order[1]).

This idea has been based on the general aspect of the verrucous dermatitis fungi, with dematiaceous stages of vegetative multiplication, as well as on the shape and size of flask-shaped conidiophores, different from the typical phialidia.

Afterwards, the paper of Karrer & Conant (1953) on the cleistothecium-like structure found in *Hormodendrum pedrosoi* confirmed, in a certain way, this idea.

The idea has been advanced following the study of several strains of *Phialophora pedrosoi* (Brumpt) Cif. et Red. (1942)[1][2]), *P. compacta* (Carrion) Cif. et Red. (1942)[2]) and *P. verrucosa* Thaxter (1915).

This hypothesis has been tentatively checked: 1) by experimental inoculation in laboratory animals of cultures of sooty-mold fungi; 2) by the culture on natural media of strains of verrucous dermatitis fungi.

Inoculation in animals of sooty-mold fungi

The literature on laboratory culture of sooty-mold fungi is scanty: the first successfull attempt is that of Frazer.[3])

In our experience, these cultures are short living, even on honey media [4]): the pycnidia are gradually reduced in shape and size, and the pycnidiospores less abundant; after a few subcultures the fungus is not longer growing. No ascosporic stage has been observed in culture.

---

[1]) With exception of the Kano Japanese strains, described as *Hormiscium dermatitidis* and now generally accepted as *Hormodendron dermatitidis* (Kano) Conant. The strain studied, apparently a subculture of the authentic culture, appears to be a quite atypical *Aureobasidium pullulans* (De By.) Arn., commonly called *Dematium pullulans* De Bary or *Pullularia pullulans* (De By.) Berkh. For a discussion about this species, the variability and synonymy see Ciferri & Corte (1957). The analogy between the Kano fungus and *Aureobasidium* (under *Pullularia*) has been stated also by Conant et al. (1954). But it is possible that the morphology has been influenced by about twenty years of culture in laboratory media.

[2]) These combinations, published during the World War, antedates the same combinations published two years later by Binford, Hess & Emmons (1944).

[3]) Several papers published in The Proceedings of the Linnean Society of New South Wales, from Vol. LIX (1934) onwards.

Of the several species of imperfect sooty-mold cultivated in the Institute of Mycology, the University of Recife, Pernambuco (Brazil) one unnamed strain has been carried to Pavia through the courtesy of the Director Dr. A. Chaves Batista.

A moderately thick saline emulsion of the fungus has been used by subcutaneous injections (about 0,5 ml) to guinea pigs; by intraperitoneal injections (about 0,5 ml) to rats; by intratesticular injections (about 0,2 ml) to mices, and by intravenous injections (1—2 ml) to rabbits. No diffused lesions were produced, and no death was observed. A few endoperitoneal inoculations to mice and rat were made also from a pycnidiaceous, mixed sooty-molds collected at Pavia on willow leaves.

Subcutaneous inoculation in guinea pig produced a small nodule of spontaneous reabsorption after 3—4 weeks. A biopsy made after a week revealed some aspecific reaction, with a reduced number of polymorphonuclear neutrophiles, a few peripherical giant cells and a light inflammatory reaction with macrophages. Only fragments of a yellowish to light-brown, septate mycelium has been observed.

Intraperitoneal and intratesticular injections produced more or less the same result: the formation of an aspecific granuloma, with tendency to spontaneous resolution after 3—6 weeks following the inoculation. The exsudative tendency is evident, due to the presence of abundant neutrophiles and eosinophiles, 10—15 days after the injection. The pycnidiospores are disappearing firstly, then the mycelium, as very short to short elements, together with the pycnidial wall fragments.

The same result has been observed starting from the willow sooty-mold from nature.

After a short period of stress, no effect has been observed in rabbits following the intravenous injection.

Culture of verrucous dermatitis fungi on natural media

We followed two ways: first we cultured the fungi on autoclaved grass and broad green leaves, timber, humic natural and artificial soil, and so on, as a part of a program of morphological investigation about pathogenic, human fungi in the saprophytic stage. The results were not important to our purpose: the growth of most of the strains has been abundant, but with the usual morphology.

In another test small grass leaves and broadleaves from several species were cold-sterilized using either ethylen or propylen oxides.

---

[4]) One of the best media used is an agarized solution of about 10 % of commercial honey; 0,5 % of asparagine; 0,1 % of potassium monophosphate (biacid); 0,1 ml of A—Z Hoaghlands's solution.

One Brazilian strain of *Phialophora verrucosa* developed many perithecial empty ascocarps or pycnidia, very similar to those described by AJELLO (1952), AJELLO & RUNYON (1953) and by KARRER & CONANT (1953) from laboratory cultures of the same fungus. Unfortunately, no ascospores nor pycnidiospores were found even after 4 months. But the morphology of this empty fructiferous body is interesting.

The wall of the fructiferous body is composed of one external layer of polygonal cells, yellow-brownish in color, without well defined internal layers, but with some tabular aggregation of hyaline to subhyaline, similar cells. In the body scattered brownish to subhyaline, branched and more or less tangled hyphae are found, apparently without ascogenous primordia. The consistency of the empty body is membranous to subcarbonaceous, as a rule of 50—80 μ in diameter.

On the surface more or less abundant brown mycelia, as a rule, with sparingly septate setae are found. The setae are thinner and lighter at the top, attenuate to acutate, 80—150 μ in length, without thickened base, of the same diameter of the mycelial hyphae. The setae are similar to those found in the perithecia and/or pycnidia of members of Capnodiales order.

CONANT & MARTIN (1937), then EMMONS (1937), suggested that the phialidia-born conidia might serve as spermatia [5]), but this idea has not been experimentally demonstrated. REDAELLI & CIFERRI (1942) emphasized certain similarities of the *Phialophora* type of phialidia with the rudimental stages of sooty-mold pycnidia.

The phialospores of *Phialophora* are frequently-not always-dimorphic: short oval and ellipsoid elongate ones, the last shape being, as a rule, the shape of the first phialospore produced.

For a through discussion about the morphology of the several kinds of phialospores and the significance of the collaretted neck, see HUGHES (1953).

On cold-sterilized leaves, the phialidia of *Phialophora* are aberrant from the true phialidia of the phialidipherous, moniliaceous fungi, as found, e.g., in the Aspergillaceae family. The phialidia-like bodies of *Phialophora* are short and stout, with a rounded to pyriform base, a very collaretted, large and opened summit, and a wide mouth. The phialospores, then, are ejected without shape modification, even in pair, while the true phialospores are narrowed along the way through the long, slender neck, and rounded only when free.

CONCLUSION

The affinity of the fungi of verrucous dermatitis with the Capnodiales (or sooty-molds) group is marked by several morphological characteristics:

---

[5]) Conidia perhaps functioning as spermatia are observed by HUGHES (1951) on *Lasiosphaeria hirsuta* (FR.) CES. et DE NOT. conidial stage, of the *Phialophora* type.

1) the morphology and the wall structure of the hairy and empty, fructiferous bodies of some human strains of *Phialophora* is similar to the shape and wall structure of certain Capnodiaceous fungi having hairy pycnidia (and/or perithecia);

2) the short and bulky "phialidia" of certain human strain of *Phialophora*, having collaretted, cup-like structure and ejecting conidia in great number, are similar to small pycnidia of Capnodiales more than to true phialidia as found in typical phialidipherous fungi like, e.g., members of the Aspergillaceae family;

3) in addition to pycnidia, *Hormodendron*-like and *Acrotheca*-like structures are of usual occurrence in sooty-molds, both in nature and in culture (on natural media), even independently of dematiaceous fungi associated in the 'sooty-mold complex' on leaves.

In spite of negative result of the animal inoculation with laboratory culture of a pycnidial sooty-mold and with the same fungi from willow leaves, the chromomycosis strains of *Phialophora* phyletically appears as a regressive branch of specialized Capnodiales fungi, growing better on lignin than on honey-dew, and only occasionally on man.

Summary

A culture of the Capnodiales group of fungi and sooty-molds from leaves were not pathogenic to laboratory animals.

But the analogy of cultures on natural and laboratory media and the comparative morphology of the peculiar pycnidia of sooty-molds, as compared with the cleistothecium-like and 'phialidia' of human strains of *Phialophora* is evident, not to mention the common *Hormodendron*- and *Acrotheca*-stages.

It is assumed that human *Phialophorae* are a degraded, lignicolous branch of Capnodiales fungi.

Literature

AJELLO, L. & RUNYON, L. (1953) *Abortive "perithecial" production by Phialophora verrucosa*; Mycologia, **XLV,** 945—950.

AJELLO, L. (1952) *The discovery of sexual reproduction in Phialophora;* Bact. Proc. 90.

CONANT, N. F. & MARTIN, D. S. (1937) *The morphologic and serologic relationships of the various fungi causing dermatitis verrucosa (chromoblastomycosis)*; Amer. J. trop. Med., **XVII**, 553—577.

EMMONS, C. W. (1937) *Sporulation of the Phialophora type in Hormodendron*; Mycologia, **XXIX,** 327—333.

HUGHES, S. J. (1951) *Studies on micro-fungi. XI. Some Hyphomycetes which produce phialides*; C. M. I. Pap. No. 45. Kew.

HUGHES, S. J. (1953) *Conidiophores, conidia and classification*; Can. J. Bot., **XXXI,** 577—659.

KARRER, H. & CONANT, N. F. (1953) *A cleistothecium-like structure found in Hormodendrum pedrosoi*; Mycologia, XLV, 693—697.

REDAELLI, P. & CIFERRI, R. (1942) *Le granulomatosi fungine dell' uomo nelle regioni tropicali e subtropicali.* Firenze.

SAGGIO DI INOCULAZIONI INCROCIATE DI FUNGHI PATOGENI TRA ANIMALI E PIANTE[1]

(+) P. Redaelli
Istituto di Anatomia ed Istologia Patologica, Università di Milano.

R. Ciferri
Istituto Botanico e Laboratorio Crittogamico, Università di Pavia.

5.II.1958

Queste prove hanno cercato la possibilità di fondare una *micopatologia comparata* sulla base dei risultati di inoculazioni incrociate ad animali inferiori e a piante di funghi patogeni per l'uomo (e gli animali superiori), di insetti e di piante, malgrado il fatto che i primi risultati fossero poco incoraggianti.

Diamo conto qui soltanto di alcune poche esperienze che giunsero a qualche conclusione, sia pur negativa.

Inoculazione in rane

Una media di 10—12 rane (*Rana esculenta*) fu inoculata con 1 cc di una densa sospensione di una parte delle specie fungine prescelte, da culture giovani su agar pepto-glucosato, per via intraperitoneale. I risultati sono stati i seguenti:

1. *Botrytis cinerea* Pers. (da uva)
Inoculata il 20/IV/1939.
Una sola rana è morta spontaneamente il 12.V. Le altre sono state sacrificate tra il 10.V e il 20.V. Tutte mostrano un granuloma biancastro diffuso nella plica gastro-duodenale, e talora una pseudomembrana alla superficie del fegato. Qualche individuo mostra una massa lobulata giallastra, senza apparente reazione granulomatosa, nella sottocute aderente alla cute nel punto d'innesto. Grandi masse fungine scarsamente granulomatose nella plica gastrica, con poche aderenze. Qualche inizio di disseminazione al polmone.

---

[1] Un riassunto parziale di queste prove è stato presentato dai due Autori al Third International Congress for Microbiology, New York, 2—9 September 1939 (Sect. VI, Paper No. 5) e pubblicato nel 1940 (Redaelli P., Ciferri R. e Baldacci Blastomycosis, Sporotrichosis and Coccidioidal granuloma on animals and plants. Mycopathologia, **II**, 322—326 1940. Le esperienze furono quindi proseguite dai due Autori seniores, secondo una più vasta scala di ricerche, sinchè il sopraggiungere della guerra e le difficoltà di lavoro inerenti obbligarono a sospenderle. Ancora nell'intento di onorare la memoria del compianto amico e collaboratore Prof. P. Redaelli, ci decidiamo a dare alla luce queste note, ora pubblicate in esteso, completate con le prove eseguite dopo la presentazione della nota suddetta. R. C.

2. *Coccidioides immitis* Stiles.
Inoculato il 18/IV/1939.
Due rane sono morte spontaneamente il 23.V e il 10.V. Le altre sono state sacrificate tra il 23.IV e il 20.V. Le rane sacrificate dopo 6 giorni dall'inoculazione presentano sotto la cute, nel punto di inoculazione, una masserella gelatinosa che risultò essere un grumo di fungo attorniato da una massa di cellule di reazione (leucociti?). Nello striscio non si vedono che elementi micelici del fungo senza sporangi o forme rotonde. Nella cavità addominale vi sono delle masserelle analoghe aderenti allo stomaco e sopratutto nella plica gastrica. Qualche altra piccola masserella sulla superficie del peritoneo.

Un'altra rana sacrificata dopo 16 giorni presenta aderenze della cute nel punto d'innesto, con ispessimento nella parete muscolare dell'addome nella stessa regione e un vasto granuloma a pliche grigio-giallastre nell'omento, che congloba stomaco ed intestino in un unico ammasso.

Una striscia non mostra sporangi nè altri corpuscoli rotondi, ma residui di ife fungine. In tutte le altre rane si ha il solito granuloma circoscritto alla plica gastro-duodenale con reazione omentale e in talune anche qualche masserella granulomatosa nel piccolo bacino.

3) *Gilchristia dermatitidis* (Gilchr. et Stokes) Cif. et Red. (forma filamentosa).
Inoculata il 18/IV/1939.
Tre sono morte spontaneamente il 30.IV, il 31.IV e il 17.V. La prima presenta una vegetazione sull'omento. La seconda ha un ascesso sottocuraneo molto aderente, come la terza. Le altre, sacrificate tra il 4.V e il 20.V, presentano tutte un granuloma segregatore omentale più o meno evidente, di colorito bianco-grigiastro.

4) *Paracoccidioides brasiliense* (Splend.) Almeida (forma filamentosa).
Inoculato il 18.IV.1939.
Nessuna è venuta a morte spontaneamente. Sacrificate tra il 24.IV e il 20.V non si è notato nulla di particolare.

5) *Phialophora verrucosa* Medlar.
Inoculato il 18.IV.1939.
Una è morta spontaneamente dopo 24 ore dall'inoculazione. Presenta delle masserelle nerastre in corrispondenza della plica gastrica. Le altre sono state sacrificate tra il 4.V e il 20.V. Tutte hanno piccoli noduli neri all'omento e nei connettivi del bacino. Una presenta una massa aderente, piatta. Una rana, sacrificata dopo 6 giorni dall'inoculo, presenta una massa aderente, piatta, a strie, sulla superficie dello stomaco e particolarmente addensata nella curva gastrica; il materiale osservato a fresco tra due vetrini, mostra la massa del fungo brunastro, con scarsa reazione infiammatoria (molto più scarsa che quella de e *Coccidioides immitis* sulla rana).

6) *Sporotrichum beurmanni.* MATR. et RAM.
Inoculato il 24.IV.1939.
Due rane morte spontaneamente il 6.V. e l'8.V. La prima presenta la massa fungina aderente tra parete addominale e fegato con le anse intestinali, senza evidente reazione attorno al fungo. L'altra rana mostra aderenze del fegato alla parete con deposito del fungo, scarso nell'omento. In tutte le altre rane, sacrificate tra il 12.V e il 20.V, si ha un granuloma di segregazione fungina, nerastro, nella plica gastro-duodenale.

7) *Sporotrichum poae* PECK (da garofano).
Inoculato il 24.IV.1939.
Una morta spontaneamente il 20.V; le altre sacrificate tra il 12 e il 30.V. In tutte si ha uno scarsissimo granuloma segregatore nella plica gastro-duodenale.

Inoculazioni su piante di fava e di ricino

Piantine di fava (*Faba vulgaris*) alte non meno di 10 cm sono state incise, previa disinfezione superficiale, con una lancetta sterile, e nella ferita così prodotta si è immessa una piccola quantità di materiale da una cultura recente dei funghi, proteggendo l'inoculazione con cotone idrofilo che si è mantenuto umido per due settimane circa.

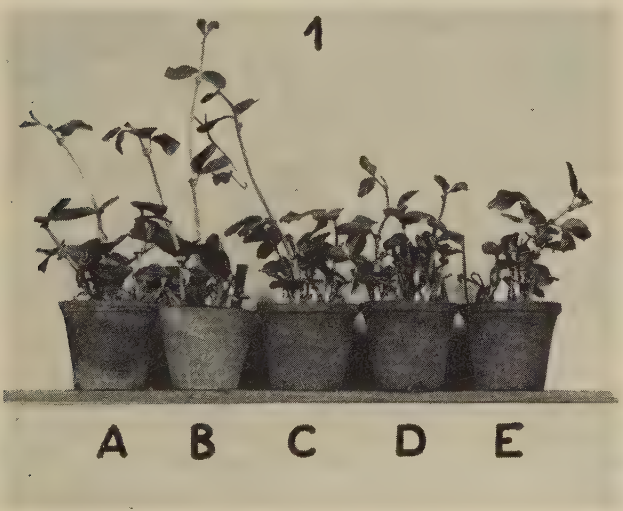


Fig. 1. Effetto negativo delle inoculazioni di *Paracoccidioides brasiliensis* (A), *Coccidioides immitis* (B), *Phialophora verrucosa* (C), e positivo di *Botrytis cinerea* (D) e *Sporotrichum poae* (E) su piantine di fava.

Dopo aver seguito il decorso dell'infezione durante questo lasso di tempo, il fusto inoculato è stato reciso e sezionato. Ogni vaso (corrispondente ad ogni fungo) aveva da 10 a 15 piantine di fava, tutte inoculate. In caso di mancato attecchimento del patogeno, l'infezione si è ripetuta sollo stesso fusto dopo circa una settimana dalla prima inoculazione.

Coccidioides (fig. 1, B), *Gilchristia* (fig. 2, A), *Paracoccidioides* (fig. 1, A) e *Phialophora* (fig. 1, C) non hanno attecchito. Invece si è manifestata una forte necrosi nei fusti di piante inoculate sia con *Botrytis cinerea* (fig. 1, D) che con *Sporotrichum poae* (fig. 1, E) Una certa necrosi, meno vasta ed evidente che per *S. poae* (fig.2, B), è stata provocata pure dallo *S. beurmanni* (fig. 2, A).

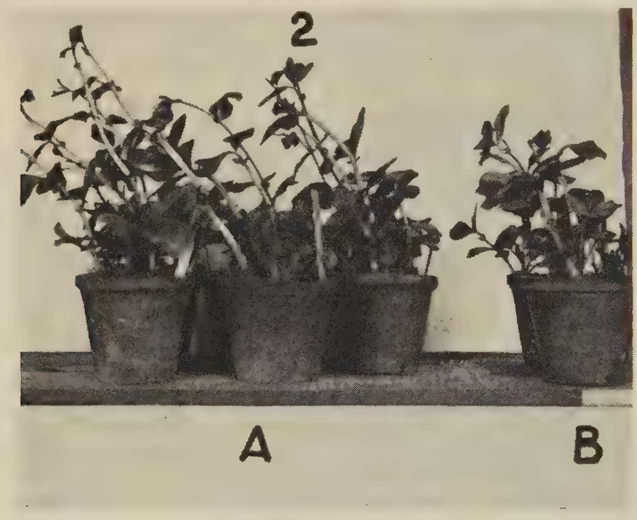


Fig. 2. Effetto di inoculazioni di *Sporotrichum beurmanni* (A) e di *S. poae* (B) su piantine di fava.

Simili prove sono state ripetute per il ricino (*Ricinus communis*, varietà a foglie rosse) con analoghe reazioni, ma allorquando positive, tutte assai meno evidenti che su fava.

Conclusioni

L'inoculazione di funghi patogeni per l'uomo alle rane (*Coccidioides, Gilchristia, Paracoccidioides* e *Phialophora*) porta alla formazione di granulomi aspecifici con scarsa reazione anche nella zona di deposito gastro-duodenale. Ancor meno attivi sembrano i due funghi patogeni per le piante *Botrytis cinerea* e *Sporotrichum poae*, ma anche lo *S. beurmanni*. Al contrario, *Botrytis* e *Sporotrichum poae*, sono nettamente patogeni per la fava (meno per il ricino), quando non lo sono affatto i funghi patogeni per l'uomo.

La potenziale patogenicità bivalente — per gli animali e per le piante — dello *S. poae* risulta anche da questa prova d' infezione.

Summary

Common frogs (*Rana edulis*) were inoculated intraperitoneally with the following fungi: 1) pathogenic for man and animals: *Coccidioides immitis*, *Gilchristia dermatitidis*, *Paracoccidioides brasiliensis*, *Phialophora verrucosa* and *Sporotrichum beurmanni*; 2) pathogenic for man and plants: *Sporotrichum poae*; 3) pathogenic for plants: *Botrytis cinerea*. The fungi of the group 1) (and, to a lesser extent, the group 2) produced a localized granuloma, without (or almost without) dissemination, with a reduced, aspecific reaction, chiefly in the gastro-duodenal plica. The species of the group 3) is not pathogenic at all.

On the contrary, for broad bean young plants (and, to a lesser extent, castor bean plants) the fungi of the group 1) were not pathogenic, while the fungus of the group 3) was fully pathogenic. *S. poae* appears to be of moderate pathogenicity; less pathogenic has been *S. beurmanni*.

REIDENTIFICATION OF *COCCIDIOIDES PERIPLANETAE*

R. Ciferri

Centro di Micologia Medica "Piero Redaelli", Istituto Botanico della Università di Pavia, Italia

(5.II.1958)

Up to now, the only recognized species of the genus *Coccidioides* Stiles ¹) is *C. immitis*, the well known agent of the so-called ,,coccidioidal granuloma".

In the literature, another species of the same genus is found: *C. periplanetae* Avrech ²), described on the epithelial cells of the digestive apparatus (including oesophagus) of the common cockroach (*Periplaneta orientalis*).

The fundamental morphology is that of rounded corpuscles, at first of 4—8 μ in diam., then growing up to 13—15 μ. like sporangia: the protoplasma is fragmented, then individualized as endospores. The liberation of the endospores is made through the rupture of the maternal bag, and the free spores are ejected from the epithelial cells to the content of the intestinal tube. Sometimes the formation and liberation of endospores, according to the description, is more complicated, but not clearly explained.

There is no doubt that *Coccidioides periplanetae* is but *Coelosporidium periplanetae* (Lutz et Splendore), a common mild parasite of the Malpighian tubes of cockroaches, identic with *C. blattellae* Crawley. The life cycle of this Haplosporidian microorganism is well known, and one of the most recent papers on the subject is that of Sprague ³).

According to Avrech, the initial infection is caused by some ameboid corpuscles penetrating in the interior layer of the oesophagus, reaching to the middle in testine and found even in the hemolymph.

If so, the microorganism should not be classified as a species of the genus *Coelosporidium* (nor, of course, as a *Coccidioides* species). But description and figures are both confusing. It is stated that this fungus is allied with an enigmatic Protista: *Nucleophaga hypertrophica*, a chytridiaceous fungus according to Avrech, but really an unrecognizable species, probably described on the basis of two different morphologies.

It is even possible that the ameboid form observed by Avrech, if confirmed, may be assigned to another microorganism.

LITERATURE

¹) In Rixford & Gilchrist, Johns Hopkins Hosp. Repts, **I**, p. 209 (1896).

²) Avrech, Arch. f. Protistenk., **LXXIV**, 136—248, tab. V (1931).

³) Sprague, Trans. Amer. Micr. Soc., **LIX** (1940).

REVISION DE LAS INVESTIGACIONES SOBRE MICOLOGIA MEDICA Y DE LA LITERATURA EN CUBA DURANTE EL DECENIO DE 1945 A 1955

CÉSAR A. FUENTES

(*Catedra de Patologia Experimental, Escuela de Medicina Universidad de la Habana*)

(3. XII. 1957)

Desde el año 1925 los Dres. JOSÉ ALFONSO ARMENTEROS (1), FERNANDO TRESPALACIOS (2) RAMÓN VIDAL (3), han sido los que más tesoneramente se han dedicado al estudio de la Micologia Médica en Cuba. El interés por la misma prácticamente estaba limitado a las dermatomicosis en los primeros años.

El descubrimiento en este país del primer caso de vaginitis moniliásica y su publicación en el año 1942 hizo que los ginecólogos y obstetras fijaran su atención hacia esta entidad clinica y desde entonces se multiplicaron sus hallazgos.

Los laboratoristas cubanos se esforzaron en los estudios micológicos lo que trajo como resultado la invitación al Dr. NORMAN F. CONANT para que dictara un curso sobre Micología Médica en la Cátedra de Patología Experimental de la Escuela de Medicina de la Universidad de la Habana.

Al curso del Dr. CONANT asistieron dermatólogos y laboratoristas. Lo más importante del mismo fue que se pudo desvanecer la creencia de que la taxonomía micológica era extraordinariamente complicada. Los conceptos unicistas actuales fueron la clave de una mejor comprensión de la Micología Médica.

Desde esta fecha hasta el presente en los laboratorios de Micologia Médica de los Servicios de Dermatología y Sifilografía de los Dres. BRAULIO SÁENZ y PARDO CASTELLÓ y en el laboratorio Clínico del Hospital de Maternidad Obrera, los Dres. ALFONSO, TRESPALACIOS y VIDAL continúan trabajando sobre las micosis. En la Cátedra de Patología Experimental se explican las micosis profundas y en el laboratorio se reciben muestras para diagnoóstico y se realizan investigaciones sobre Micologia Médica. Las investigaciones micoló-

---

1) Jefe del Laboratorio de Micología de la Cátedra de Dermatología y Sifilografía, Profesor BRAULIO SÁENZ.

2) Jefe del Laboratorio de Micología de la Cátedra de Dermatología y Sifilografía, Profesor VICENTE PARDO CASTELLÓ.

3) Laboratorista del Hospital de Maternidad Obrera.

gicas, casos clinicos y estudios de hongos ambientales en ese decenio se expresan a continuación.

Un trabajo experimental para conocer la o las localizaciones orgánicas de la *Candida albicans* en conejos, curieles, ratas y ratones inoculados por vía venosa fue realizado por FUENTES (8). La diferenciación en los tejidos se hizo por cortes en congelación y tinción con Sudán láctico. Los órganos en que se localizó preferentemente este hongo fueron los riñones, cerebro y la próstata de la rata.

Con el fin de resolver el problema de als contaminaciones con hongos saprofitos de las lesiones micóticas expuestas al exterior tales como las dermatomicosis, pie de madura, cromoblastomicosis, trayectos fistulosos, esputos, etc., así como las posibles contaminaciones en los laboratorios, FUENTES et al., (9), incorporaron al medio usual de agar Sabouraud con penicilina y estreptomicina el antibiótico cycloheximide, el cual es inhibidor de hongos saprofitos. Un estudio comparativo entre este medio y el Sabouraud usual se realizó en 20 pacientes del Servicio de Dermatología del Profesor VICENTE PARDO CASTELLÓ con micosis tales como tinea pedis, tinea corporis, epidermofitosis vesicular, onicomicosis, epidermofitosis escamosa, paronichia y cromoblastomicosis, así como otras afecciones no micóticas como eczema alérgico, lepra lepromatosa y eczema eritematoso vesicular, y se pudo observar que la actidiona (¹) no impidió el crecimiento de los hongos patógenos aislándose II en el medio de actidiona y 10 en el Sabouraud sin esta sustancia. Del total de 40 tubos sembrados, solamente 3 mostraron contaminación en el medio de actidiona, en tanto que 8 del agar Sabouraud sin actidiona se Ilenaron de hongos saprofitos. El crecimiento de bacterias contaminantes fue igual en ambos medios.

Se hizo también otro estudio comparativo entre el medio de actidiona y el Sabouraud usual con la colección de patógenos y saprofitos mantenidos bajo aceite mineral en la cual se pudo apreciar una inhibición parcial sobre *Candida guilliermondi*, *Candida stellatoidea*, *Candida tropicalis*, *Monosporium apiospermum* y entre los saprofitos una inhibición completa de *Rodotórula sp.*, *Trichoderma sp.*, *Helmintosporium sp.*, *Nigrospora sp.*, ty *Paecilomyces sp.*, así como una inhibición parcial en *Aspergillus glaucus sp.*, *Fusarium sp.*, *Penicillium sp.*, y *Rizopus sp.*, en tanto que el *Aspergillus fumigatus*, *Alternaria* y *Syncephalastrum* crecieron casi igual aque en el medio testigo de Sabouraud.

El material de un ganglio inguinal de un caso de Histoplasmosis mostró un crecimiento demorado en el medio de actidiona comparado con el Sabouraud usual, empero a los 10 días el crecimiento en ambos medios era igualmente profuso, no encontrádose alteraciones morfológicas en los clamidosporos en el medio de actidiona.

Los mismos autores (10) el estudiar en el conejo la patogenicidad

---

¹) Nombre comercial de la cycloheximide fabricada por la Upjohn Co., Kalamazoo, Michigan.

de 30 cepas de *Cándida albicans* aisladas de vaginitis moniliásica en el ser humano, encontraron síntomas nerviosos tales como paresia y contractura de los músculos del ceullo, lo cual motivó el deseo de conocer si otros animales de laboratorio tales como curieles, ratas y ratones pudieran presentar los mismos síntomas. El resultado se expresa a continuación:

TABLA I. SINTOMAS

	Ratas	Ratones	Curieles	Conejos
Somnolencia	50 %	17 %		
Hemorragia nasal	83 %			
Hemorragia ocular	83 %			
Contractura de la nuca	17 %			33 %
Paresia	67 %	17 %	50 %	
Movimiento coreático	17 %			

En la autopsia se recuperó el organismo principalmente de los riñones, cerebro y vesícula biliar. La próstata de la rata se encontró con abcesos abundantes y muy aumentada de tamaño. También se aisló de las vesículas seminales y del globo ocular del conejo y en algunos casos se pudo aislar de casi todos los órganos. Las lesiones que más llamaron la atención fueron las del cerebro y próstata en conejo y rata respectivamente. Se hace un estudio histológico principalmente de las lesiones del sistema nervioso y próstata.

Llama la atención el hallazgo de blastosporos y pseudo-hifas en la luz de algunos capilares, ocasionalmente rodeados de células endoteliales descamadas, y en las afueras de estos capilares, hematíes, seguramente provenientes de la lesión producida en el endotelio, lo cual sugiere la posibilidad de un efecto tóxico sobre este endotelio.

FUENTES et al., (11), han podido aislar un nuevo tipo de *Microsporum gypseum*, pero de tamaño de 12 a 18 micras como promedio y ninguna mayor de 24 micras (Fig. 1). Esta característica ha sido mantenida durante más de 5 años. Este nuevo dermatofito fue aislado de un kerion en una placa microspórica del cuero cabelludo en un niño y en cuyo pelo se encontró repetidamente un hongo con una imagen similar a la del *Trichophyton schoenleini* (Fig. 2). El pelo mostró una fluorescencia verde a la lámpara de Wood. Fue aislado en Sabouraud actidiona y probó ser patógeno para el ser humano experimentalmente asi como para curieles jóvenes. Se le denominó *Microsporum nanum* a causa del tamaño de las macroconidias. Es curioso que en cientos de pelos examinados no se encontró invasión del mismo en las inoculaciones.

Durante la investigación de la patogenicidad del *Microsporum nanum*, el *Trichophyton mentagrophytes* fue aislado de algunos pelos de las lesiones experimentales, en tanto que de otros pelos crecían colonias del hongo inoculado; por esta razón se consideró importante conocer la posible existencia del *Trichophyton mentagrophytes* en la cría de curieles del laboratorio en que se hizo el trabajo y de todos los criaderos de la Habana los cuales estaban distantes unos de otros (12). Pelos de 113 curieles sanos procedentes de dichos criaderos cortados del lomo se sembraron en el medio de Sabouraud

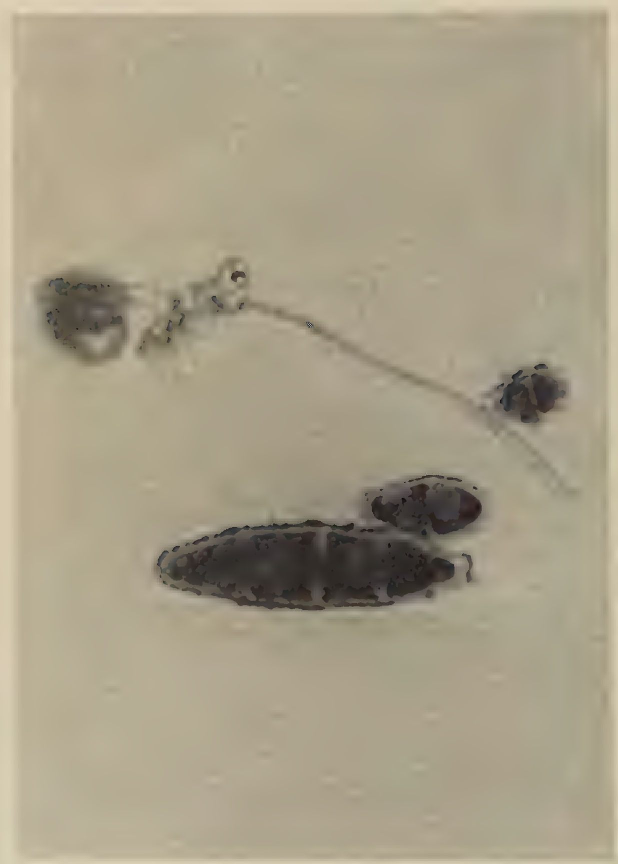


Fig. 1. Observese la diferencia de tamaño entre el *Microsporum gypseum* y el *Microsporum nanum*. (FUENTES, C. A. et al.)

actidiona, el cual no inhibe el crecimiento del *Trichophyton mentagrophytes*. De estos 113 curieles fueron positivos del *Trichophyton mentagrophytes* el 13 %. Debe señalarse que en el criadero donde se realizaba el trabajo con el *Microsporum nanum* se pudieron encontrar tres curieles con lesiones a los lados de la nariz y de los ojos mostrando los pelos de este sitio una invasión ectothrix y los cuales sembrados dieron lugar a colonias de *Trichophyton mentagrophytes*.

Se interpreta la presencia de este hongo en los pelos de curieles como un transporte mecánico por contacto con los que tenían dichas lesiones ya que estos animales son criados en colonias.

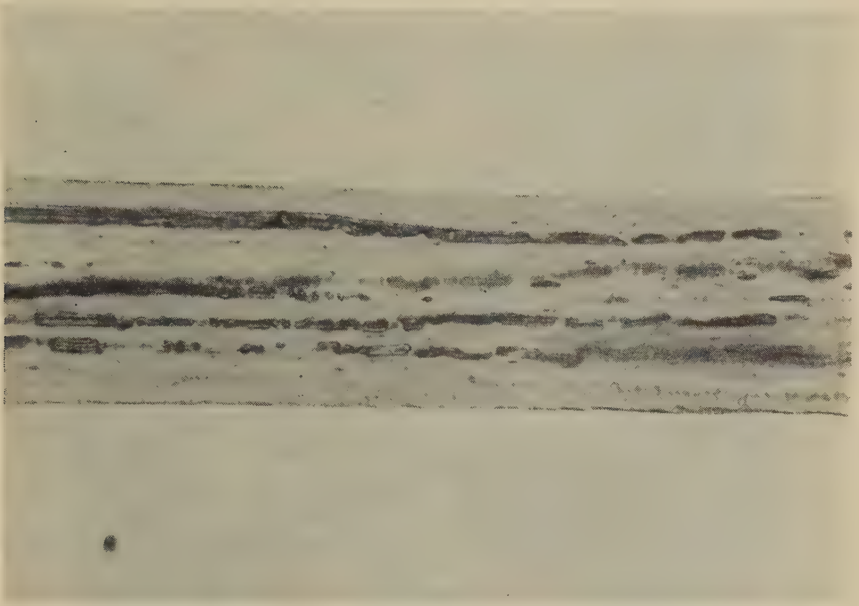


Fig. 2. *Microsporum nanum* en el pelo del paciente. (FUENTES, C. A. et al.)

Hallazgos similares de *Trichophyton mentagrophytes* más *Microsporum gypseum* fueron encontrados en gatos jóvenes sanos al sembrarse sus pelos en Sabouraud actidiona (13). El examen microscópico de los pelos tratados con KOH al 10 % no demostró la presencia de ningún hongo. La tierra obtenida del lugar donde vivían estos gatos que era en los restos de la muralla que en una ocasión circundara la ciudad de la Habana, fue negativa de *Trichophyton mentagrophytes* o *Microsporum gypseum*. Esta tierra fue estudiada por siembra sobre pelos estériles.

Teniendo en cuenta que los curieles en los criaderos de la Habana son alimentados solamente con yerbas que crecen en los espacios no fabricados de la ciudad o sus suburbios y que de ellos se había aislado el *Trichophyton mentagrophytes*, se pensó que la tierra de estos sitios pudiera alojar el *Trichophyton mentagrophytes*, el *Microsporum gypseum* y aún el *Microsporum canis*. Su aislamiento de estas tierras confirmaria la moderna creencia sustanciada por el hallazgo de otros hongos patógenos de la tierra, de que los animales que transmiten ciertas dermatomicosis al ser humano como perros, gatos etc., adquieren de ese sitio la infección. De estas muestras se aislaron el *Microsporum gypseum* creciendo sobre pelos estériles humanos colocados sobre las muestras de tierra (14). El *Microsporum gypseum* fue patógeno para el ser humano.

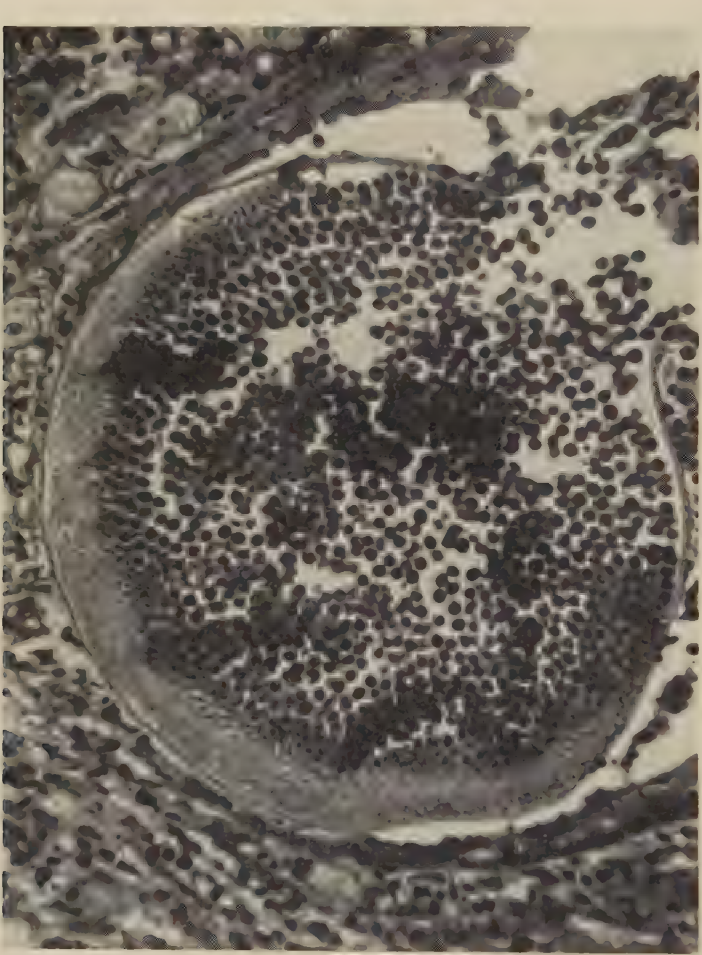


Fig. 3. Sporangio maduro y dehiscente del *Rinosporidium Seeberi*. Imagen observada en ambos pacientes. (León Blanco, F. & Avalos, M. A.).

Fuentes & Wolf (15) estudiaron perithecios encontrados en distintas cepas de *Fonsecaea pedrosoi* y creyeron que eran su forma perfecta. Más tarde comprendieron que era una contaminación producida por los ácaros que invaden los cultivos de hongos en algunos laboratorios; en un trabajo posterior (16) clasifican el organismo como *Microascus cinereus*.

Además de estas investigaciones aparece en la literatura el reporte del primer caso de Rinosporidiosis en Cuba (20), en una niña de 10 años, natural de una población del interior del país en la cual no hay pantanos en sus alrededores, la que presentaba pólipos nasales que en los cortes histológicos mostró los esporangios típicos de *Rinosporidium Seeberi* (Fig. 3).

Otro caso de Rinosporidiosis ha sido reportado por el Dr. HACES (18), en un adulto habitante denun terreno bajo.

Un caso interesante de pitiriasis versicolor (23), ha sido descrito en una mujer negra con lesiones que variaban en tamaño entre puntiformes y numulares, aisladas o confluentes, unas de color gris y otras de color pizarra cubiertas de escamas donde al examen directo se observa un micelio con las características de la *Malassezia furfur*. El cultivo en Sabouraud fue negativo de hongos o bacterias. En la biopsia se encontró el hongo. Se acompañan fotografías del caso clinico y del hongo de la biopsia.

El Dr. DE LAOSA (19) revisa las dermatomicosis en Cuba. Coloca las microsporias en primer lugar y las tricofitias en segundo lugar. Señala, como es cierto, que hasta el presente no se ha encontrado en Cuba el *Microsporum audouini*. Dice encontrar una fluorescencia violácea más o menos clara en las infecciones por el *Trichophyton crateriforme* y señala que esta fluorescencia es poco visible en el *Trichophyton acuminatum* ¹). Reporte el hallazgo del *Trichophyton rubrum* y del *Trichophyton ochraceum* en la tiña de la barba.

Las tricofitias del cuero cabelludo y piel lampiña producidas por el *Trichophyton mentagrophytes* en personas que de alguna forma mantenían contacto con animales como conejos, caballos, cabras y gallinas se estudia por el Dr. RÍO LEÓ (28), el cual encontró en el examen del pelo de dos conejos y su siembra el *Trichophyton mentagrophytes*. No se hace mención de ninguno de los otros animales También estudia las tiñas del cuero cabelludo producidas por el *Trichophyton roseum*.

El Dr. VIDAL (32) presenta una estadística de 96 casos de tiñas del cuero cabelludo de las cuales se aislaron los siguientes dermatofitos:

Microsporum canis	70	72.91 %
Microsporum fulvum	1	1.04 %
Trichophyton tonsurans	21	21.78 %
Trichophyton sulfureum	1	1.04 %
Trichophyton purpureum	1	1.04 %
Trichophyton violaceum	2	2.08 %

En todos estos casos el diagnóstico clínico fue realizado por un dermatólogo. Se hizo examen bajo la luz fluorescente de los pelos y examen miscroscópico para comprobar la presencia y distribución

---

¹) Hoy día considerado *Trichophyton tonsurans*.

de los hongos. El diagnóstico de la especie se realizó por siembra en el medio de Sabouraud y de agar arroz. El material de estudio provenía de distintos Servicios de Dermatología de la ciudad de la Habana, tales como el de la Cruz Roja Nacional, el de la Infancia, del Hospital Mercedes y del Hospital Militar.

Se hace referencia a otras estadísticas cubanas y se acompañan fotografías de los distintos hongos aislados de los pelos parasitados.

El Dr. José Alfonso Armenteros (2) presenta algunos datos sobre la tiña del cuero cabelludo en Cuba y opina que no parece existir la misma variedad de tricofitos en Cuba que en otros países y menciona que el *Trichophyton mentagrophytes* es el que más comunmente ha encontrado en la tricofitia del cuero cabelludo como lo es así mismo en la barba y bigote del adulto; creyendo posible que la frecuencia de este hallazgo se deba a la manipulación de ciertos animales como el perro y el gato, antecedente que según él existe en algunos de sus casos y menciona como apoyo de esta tesis los trabajos de Fuentes y colaboradores que reportan haber aislado el *Trichophyton mentagrophytes* y el *Microsporum gypseum* (13) de pelos provenientes de gatos jóvenes. El autor no excluye otros medios de contagio.

Según él le siguen en orden de frecuencia el *Trichophyton tonsurans* y el *Trichophyton rubrum* y hace mención de que en Cuba han sido reportados el *Trichophyton violaceum* y el *Trichophyton flavum* y que según su criterio el *Trichophyton rubrum* es el tricofito que más comunmente se observa en Cuba, aunque su hallazgo no sea muy frecuente en el cuero cabelludo.

En sus casos de tiña del cuero cabelludo por este organismo lo ha observado adoptando una franca disposición endothrix y comenta que es contrario a lo manifestado por algunos investigadores los cuales lo consideran como neoendothrix.

El *Trichophyton mentagrophytes* ha sido observado en casos de kerion, pero también en lesiones no inflamatorias correspondientes a las formas siguientes: Placas pequeñas múltiples semejantes a las producidas por el *Trichophyton crateriforme* según la descripción de Sabouraud. Placa grande y escamosa de 4 a 6 centímetros de diámetro en la que más de la mitad de los pelos se encuentran partidos a casi un milímetro de su implantación mientras que el resto de los cabellos se hayan absolutamente sanos. Lesiones peladoides de forma redondeada o irregular y así mismo de tamaño variable.

El Dr. Fariñas (17) comenta sobre dos casos de tricofitosis generalizadas observadas por él en las cuales se aisló el *Trichophyton rubrum*.

Las metástasis en la cromoblastomicosis son raras. El segundo caso entonces y primera observación de Cuba de metástasis cromoblastomicósica ha sido reportado por J. de Castro Palomino et al (24). El paciente es un campesino que presenta lesiones en los dedos y el dorso de la mano así como en la muñeca, en las cuales se encontraron esclerotes. En la cara interna del brazo del mismo lado a nivel de su tercio superior muestra una lesión elevada, redondeada, de un tamaño algo mayor de un centímetro, de color rojo y de superficie papilomatosa, escamosa, ulcerada, que deja escapar algunas gotas de pus. Su tiempo de evolución según el enfermo es de cinco meses. Otro nódulo pequeño engastado profundamente en el dermis y movible fue observado. La piel en el nódulo era normal. Este nódulo fue extirpado y al escindirlo se vio que contenía pus en el cual había numerosos esclerotes. El pus del abceso y el obtenido de la biopsia fue sembrado. Los cultivos mostraron una colonia gris vellosa la cual resultó ser una *Fonsecaea pedrosoi.* En el trabajo se acompañan fotografías de las lesiones de la mano, del nódulo extirpado y de la lesión del tercio medio superior del brazo, así como microfotografías de los microcultivos y de los cortes histológicos. En estos últimos se pueden ver los esclerotes. En las microfotografías de los microcultivos aparece una fructificación incipiente del tipo cladospórico y otra que parecen formas jóvenes acrotéquicas.

Hoy en día sabemos que organismos cercanos a los hormodendra causales de la Cromoblastomicosis como el *Cladosporium trichoides* han sido aislados en varias ocasiones de abcesos cerebrales. VANBREUSEGHEM (33) ha aislado de un abceso cerebral de un niño del Congo Belga un supuesto *Cladosporium tricoides* que estudiado por nosotros y por DANTE BORELLI (4) ha resultado ser un *Fonsecaea pedrosoi.* Ciertamente este es el primer caso publicado de invasión del sistema nervioso por el *Fonsecaea pedrosoi.* Tenemos otra cepa de *Fonsecaea pedrosoi* aislada también de un abceso cerebral de un niño del Japón que gentilmente nos la ha suministrado el Dr. IWATA[1] Esto nos hace pensar que una compenetración mayor aún que la actual entre los médicos cirujanos y los micólogos permitiría conocer mejor la Micología Médica.

El Dr. JOSÉ MESA RAMOS (22), presenta el caso de un hombre blanco de 47 años, cubano, residente de la Habana con una lesión eritematoescamosa con escamas blanquecinas, sembradas de puntos negros en el dorso de la mano izquierda de más de un año de duración. Comenzó por un punto verrucoso y se ha ido extendiendo céntricamente sin síntomas subjetivos. Trabaja en un aserradero de madera seca y verde de todas clases. Nunca ha vivido en el campo. Al examen directo se encontraron esclerotes abundantes. El diagnóstico fue aceptado como Cromoblastomicosis psoriasiforme. Este diagnóstico corresponde a la clasificación del Dr. PARDO CASTELLÓ sobre la Cromoblastomicosis.

El segundo caso de Queratomicosis negra palmar lo describe el Dr. D. ARGUELLES (1), en una mujer negra que presenta dos manchas pigmentadas de color pardo claro de forma irregular, de bordes geográficos, de tres centímetros de largo por dos de ancho en la parte central de la palma de la mano. No es escamosa ni se acompaña de eritema ni de signos de inflamación. Su superficie da la sensación de estar ligeramente elevada, no hay prurito. Existe hiperhidrosis palmar. Según refiere la enferma estas manchas desaparecen completamente al cabo de pocos días dejando al descubierto una superficie rosada sin que a la enferma haya causado ninguna sensación dolorosa. En las escamas se observan numerosos filamentos ramificados flexuosos, tabicados, de color amarillento con mamelones de forma oval o piriforme y abundantes elementos ovalados, cortos, aislados, unicelulares, igualmente amarillentos. Sembrado en Sabouraud obtuvo una colonia negra que identifica como *Cladosporium werneckii.* La afección curó rápidamente con una pomada de propionato de sodio al 10 %.

---

[1]) Comunicación personal.

En años posteriores han habido en el Servicio del Dr. Pardo Castelló otros dos casos de tinea nigra palmaris de los cuales se ha aislado el *Cladosporium werneckii.* Uno de estos cultivos estudiados por el comentarista desarrolló un micelio aterciopelado el cual en microcultivo por el método de Riddell mostró estructuras cladospóricas. Este hallazgo abunda en la controversia sobre si el *Cladosporium werneckii* produce o no fructificaciones cladospóricas.

Aunque la Actinomicosis es de antiguo conocida en Cuba, lo único que hemos podido encontrar en la literatura es un reporte de Vidal (31) sobre 15 casos de Actinomicosis; 8 de la región cérvico facial, 2 del tórax, 3 del abdomen de los cuales 2 de la región ceco apendicular y 1 de la vesícula biliar y 2 del pie.

En su búsqueda del agente causal ofrece las siguientes cifras:

Por examen directo:

Positivos	13

Por examen histopatológico:

Positivos	11
No realizados	3
Negativos	1

Por siembra:

En las siembras ha obtenido el siguiente resultado:

Actinomyces que germinan en anerobiosis	5
Actinomyces que germinan en aerobiosis	1
Negativos (que no germinan)	6
No realizada la siembra	3

El resultado del tratamiento de 20 casos de moniliasis vaginal comprobados clínicamente y micológicamente con una jalea constituída por propionato de calcio y sodio, ácido propiónico, glicerina, bentonite y agua se da a conocer por los Dres. Revilla & Vidal (27). En los 20 casos tratados, 19 curaron a los 15 días del tratamiento con la jalea haciéndose la comprobación por cultivo del material de la vagina.

Hasta el presente se han estudiado en Cuba cuatro casos de Histoplasmosis.

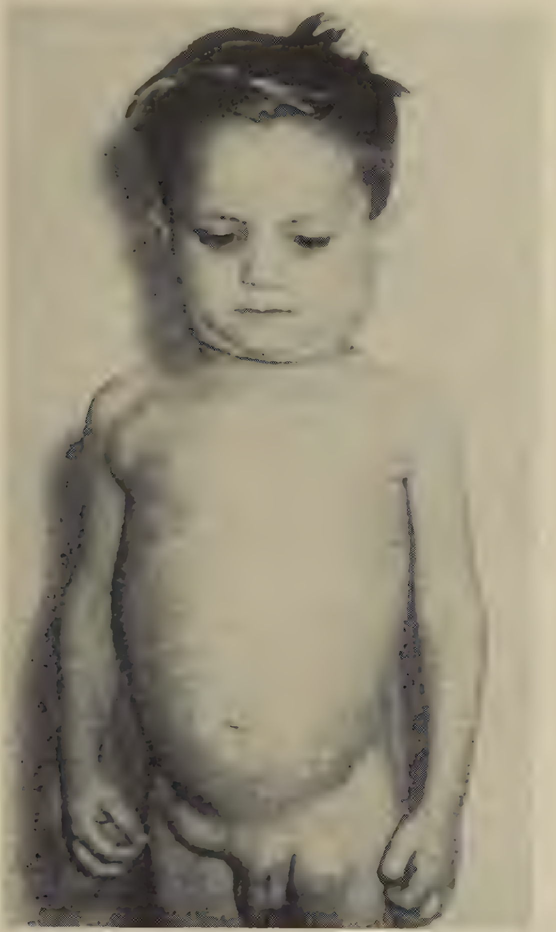


Fig. 4. Notese el aumento de tamaño de los ganglios.
(Barquet Chediak, A., Chediak, M. & Magriñat, G.).

El primer caso fue reportado por el Dr. Julio Sanguily et al (29). El diagnóstico fue realizado por el Dr. Francisco León Blanco por cortes histológicos y por cultivos de una lesión en la lengua semejante a una neoplasia. El tratamiento con una sulfona fue ineficaz y en la autopsia se encontraron lesiones avanzadas de las suprarrenales. Otros dos casos no publicados fueron estudiados por el Dr. FRANCISCO LEÓN BLANCO (21) comprobándose el diagnóstico por cultivo.

El cuarto caso (3), es el de un niño (Fig. 4), que parecía padecer de la enfermedad de HODKINS. De los ganglios, faringe y de una lesión del pie se pudo aislar el *Histoplasma capsulatum.*

Recientemente se presentaron en la Sociedad de Patólogos Cubanos algunos casos que histológicamente eran sugestivos de Histoplasmosis, pero infortunadamente no se obtuvieron cultivos.

En el año 1952 OSVALDO PARDO et al (25), hacen un survey de Histoplasmosis, Coccidioidomycosis y Tuberculosis, pensando que la ausencia de casos clínicos de las dos primeras afecciones en Cuba pudiera ser revisada con estas pruebas. Se estudiaron 195 enfermos admitidos en distintos pabellones del Hospital Universitario Calixto García de la Habana; 137 hombres y 58 mujeres, de los cuales 142 fueron blancos, 51 negros y 2 chinos. Solamente 17 no habían nacido en Cuba, pero todos habían mantenido una residencia continua en los últimos 25 años. Las enfermedades que padecían y el número de ellas fueron las siguientes:

Sífilis de todos los tipos	36 casos
Linfogranulomas venéreos	11
Dermatitis	56
Ulceras atónicas.	15
Micosis cutáneas.	12
Enfermedad de Dhuring	2

Las restantes estaban constituídas por grupos de afecciones diversas.

La Histoplasmina usada fue el lote CT-189 obtenida del Dr. C. E. ROACH de la Eli-Lilly Co., la Coccidioidina fue suministrada por el Dr. J. F. KESSELL de la Universidad de Southern California School of Medicine lote A2 y la Tuberculina se obtuvo del Hospital. Los resultados que se obtuvieron fueron los siguientes: 4 reaccionaron positivamente a la Coccidioidina (2.1 %), 40 reaccionaron a la Histoplasmina (20.5 %) y 136 reaccionaron a la Tuberculina (69.7 %). Dos de los que reaccionaron a la Coccidioidina también lo hicieron a la Histoplasmina; 12 no reaccionaron a la Tuberculina y los restantes 28 fueron positivos en los restantes antígenos.

El análisis demostró que el sexo, la raza y la distribución geográfica de la enfermedad no tuvieron relación con los resultados. Las reacciones a la Coccidioidina se interpretaron como probablemente no específicas en tanto que los que reaccionaron positivamente a la Histoplasmina fueron considerados como que en algún momento hubieran padecido la afección, concepto que reafirman mencionando el hallazgo de SANGUILY & LEÓN BLANCO en el mes de abril de 1951 y el otro caso del Dr. BARQUET CHEDIAK.

Actualmente se han realizado en el Hospital Nacional de Niños „Angel Arturo Aballí", por el Dr. ANGELBERTO DE LOS HEROS pruebas de sensibilidad de la piel en 300 niños con Coccidioidina al 1 %, Histoplasmina al 1 × 500 y Blastomicina al 1 × 1000, sin que en ninguno de los casos haya habido una reacción positiva lo cual contrasta con los trabajos de OSVALDO PARDO y colaboradores.

Los antígenos usados provinieron del Dr. FURCOLOW del Communicable Diseases Center de Kansas City, Kansas, y les fueron suministrado por el comentarista.

Los estudios de Micología ambiental se han llevado a cabo por distintos alergistas y los trabajos que hemos podido conseguir se refieren a determinaciones de acuerdo con las estaciones del año, en este caso la estación de las lluvias y la estación de seca, de los hongos del aire.

El Dr. ESTRADA DE LA RIVA (,), recoge muestras exponiendo diariamente placas de Petri de 12 cm de diámetro conteniendo medio de Sabouraud maltosa durante períodos de diez minutos en locales de la costa norte de la ciudad de la Habana y a treinta y cinco metros sobre el nivel del mar. Fueron seleccionadas dos estaciones geográficas por entender que eran las que mayor influencia tenían sobre las características fisiológicas de los hongos ambientales, la de lluvias que comprende de abril a s ptiembre y la de seca que comprende de octubre a marzo.

Las variedades predominantes durente esos siete años han sido, con ligeras variantes de estación a estación, las siguientes:

Variedad	Lluvia	Seca	Promedio
Hormodendrum	5,427	1,385	19.3
Mucor	3,640	900	12.8
Fusarium	3,778	667	12.6
Helminthosporium . . .	3.023	816	12.9
Penicillium	2,591	558	8.9
Rhizopus	2,541	574	8.8
Aspergillus	2,423	462	8.2

Este grupo comprendió el 81.5 % de todas las variedades colectadas y su número alcanzó a 28,675 colonias de un total de 35,315.

La actividad clínica de los casos de alergia respiratoria estudiados simúltáneamente en ese período, ascendieron a 3,186 pacientes de diversos síndromes respiratorios como asma bronquial, bronquitis alérgica, neumonitis alérgica (Síndrome de Loeffler), rinitis vasomotriz y sinusitis alérgica y fue paralela a las curvas de concentraciones de esporos de hongos observadas en la atmosfera, a las exploraciones cutáneas con extractos antigénicos y a las pruebas inhalantes con material micótico desecado y pulverizado practicada en los pacientes, observándose marcada exacerbación en sintomatología crítica durante los períodos de mayor concentración aérea de una variedad determinada.

De los estudios seriados de los hongos del aire en la Habana los Dres. JOSÉ CADRECHA & JAVIER FERNÁNDEZ (5), concluyen que en el número de colonias o esporos depositados en las placas de Petri expuestas al aire libremente aumentan en los días de mucho viento, pero esto no significa que el verdadero número de hongos en un volumen fijo de aire sea mayor. El aire es el vector de la diseminación de esporos, pero nada más. Los casos hipersensibles empeoran los días de mucho viento. La cantidad de hongos en el aire estacionario es mayor por la noche que por el día comenzando a aumentar la curva después de las seis de la tarde.

Empleando placas de cultivo con medio de Sabouraud y su colector los Dres. CADRECHA & JAVIER FERNÁNDEZ (5) afirman que los esporos de hongos fueron may abundantes en el aire de la Habana y sus alrededores, desde octubre a febrero y relativamente abundante desde fines de abril a comienzos de mayo. Los más importantes hongos detectados en su estudio fueron hormodendrum, aspergillus y diversas levaduras, verdaderas o falsas, con muchos otros géneros de hongos encontrados ocasionalmente. De los casos de asma y rinitis bajo su observación con hipersensibilidad a hongos del aire, el 69 % empeoraron durante el invierno, coincidiendo con el aumento de esporos de hongos en el aire en esa época. Solamente el 7 % de los pacientes sensibles a hongos empeoraron durante el verano. Del resultado estudios se deduce que la mayoría de las alergias respiratorias en la Habana fueron más severas al coincidir con la época cuando los esporos de diversos hongos fueron prevalentes en el aire.

La temperatura promedio en la Habana durante el invierno es de 22.6° C.

Adendum

Además de los reportes que aparecen en la literatura hay otros no publicados como el caso de un niño de la raza negra de unos 12 años con una ascitis de cuyo líquido se obtuvo un cultivo de *Cándida albicans*, encontrado en la Cátedra de Patología Médica, Profesor PEDRO IGLESIA BETANCOURT.

En el Hospital Infantil en el Servicio del Profesor AGUSTÍN CASTELLANOS se hizo un diagnóstico post morten de Criptococcosis por el Dr. MARTÍNEZ CURZ, Micólogo de dicho Hospital; el enfermo presentaba una meningitis y el organismo se encontró en el líquido céfalo-ráquideo. Ese mismo líquido fue cultivado en nuestro laboratorio de Micología en la Cátedra de Patología Experimental y el diagnóstico fue confirmado.

Tres casos más de Criptococcosis se han encontrado en el hospital Universitario Calixto García; uno de la Cátedra de Clínica Médica del Profesor J. CENTURIÓN en el cual hubo también un proceso meníngeo habiéndose aislado el *Criptococcus neoformans* de la médula external por el Dr. ARTURO CURBELO de la Cátedra de Bacteriología. Este cultivo fue confirmado por nosotros.

El otro caso fue de un enfermo de la Cátedra de Patología General del cual no hemos podido obtener más información.

Más recientemente en el Servicio del Dr. PARDO CASTELLÓ del Hospital Universitario Calixto Carcía se ha aislado el *Trichophyton tonsurans* por el Dr. FERNANDO TRESPALACIOS de un caso de foliculitis abscedante de Hoffman, comprobando el trabajo de JUAN RAMOS DA SILVA (30) en que se halló además del *Trichophyton tonsurans*, el *Trichophyton mentagrophytes*.

Bibliography

1. ARGUELLES, CASAL D. (Queratomycosis negra palmar: segundo caso cubano, curacióón rápida por el propionato de sodio; Bol. Soc. Cubana de Derma. y Sif. **5**, Epoca 2da. No. 2, 1948.
2. AMSENTEROS, J. A.,: Algunos datos sobre la tiña tricofitica del cuero cabelludo en Cuba; Bol. Soc. Cubana de Derm. y Sif. **12,** 2, 88—97, 1955.
3. BARQUET CHEDIAK, A., CHEDIAK, M. & MAGRIÑAT, G.: Histoplasmosis: Presentación de un caso diagnosticado por punción ganglionar; Bol. Méd. Habana. **2,** 8, Agosto 1951.
4. BORELLI, D.,: Cladosporiosis profunda. Revisión de una cepa; Bol. Lab. Clin. **1,** Enero-Marzo de 1956, 1.
5. CADRECHA, J., & FERNÁNDEZ, J.: Qauntitative Studies of Air-Borne Fungi of Havana in Each of the Twenty Four Hours of the Day; J. Allergy. **23,** 3, 259—264.
6. CADRECHA, J., & FERNÁNDEZ, J.,: Quantitative Studies of Air-Borne Culturables Spores in Havana, Cuba; J. Allergy, **26,** 2, 150—152, March 1955.
7. ESTRADA DE LA RIVA, G.: Variaciones en la Micología Ambiental de Cuba. Estudio Micológico y Clinico; Int. Arch. Allergy and Appl. Immunol. **2,** 4, 1951.
8. FUENTES, C. A.,: A Method for Differentiating Candida Albicans in Tissue; J. Bact. **51,** 2, February 1946.
9. FUENTES, C. A.: Trespalacios, F., Baquero, G. F. and Aboulafia R.; Effect of Actidione on Mold Contaminants and on Human Pathogens; Mycologia **XLIV,** 2, 170—175, March-April 1952.
10. FUENTES, C. A., SCHWARZ, J., & ABOULAFIA, R.: Some Aspects of the Pathogenicity of Candida Albicans in Laboratory Animals; Mycopathol. et Mycol. Appl. **VI,** 3, 176, 1952.
11. FUENTES, C. A., & ABOULAFIA,: R. A Dwarf Form of Microsporum Gypseum; J. Inf. Derm. **23,** 1, July, 1954.
12. FUENTES, C. A. & ABOULAFIA, R.: Trichophyton mentagrophytes from Apparently Healthy Guinea Pigs; Arch. Derm. **71,** 1, April 1955.

13. Fuentes, C. A., Bosch, Z. E., & Boudet, C. C.: Occurrence of Trichophyton Mentagrophytes and Microsporum Gypseum on Hairs of Healthy Cats.; J. Inv. Derm. **23,** 5, Nov. 1954.

14. Fuentes, C. A., Bosch, Z. E., & Boudet, C. C.: Isolation of Microsporum Gypseum from Soil; Arch. Derm. **71,** July 1955.

15. Fuentes, C. A. & Wolf, F. A. The perfect Stage of Hormodendrum Pedrosoi; Mycologia **XLVIII,** 1, 25—40, Jan.-Feb, 1956.

16. Fuentes, C. A. & Wolf, F. A. Microascus Pedrosoi is Microascus cinereus- A Correction. Mycologia **XLVIII,** 3, 446, 1956.

17. Fariñas, P.: Reunión de enero 13, 1954, del Cuerpo Médico del Servicio de Dermatología y Sifilografía del Hospital Universitario Calixto Garcia, Dr. Vicente Pardo Castelló, Dr. Pastor Fariñas y Dr. Arturo Dubé.

18. Haces, H.: Rinosporidiosis: segundo caso cubano; Rev. Cubana de Otorrinolar. No. 1, 33—44, 1952.

19. Laosa, O.: Tricofitias del cuero cabelludo y de la barba en Cuba: estudio clinico, micológico y terapéutico; Bol. Soc. Cubana Derm. Sif. Epoca 2da., **7,** 3, 123—146, Año, 1950, Habana, Cuba.

20. Leon Blanco, F. & Avalos, M. A.: Rinosporidiosis: Presentación del primer caso cubano. Revisióm de la literatura) Rev. Lepr. Derm. Sif. Año **1,** 4, 213—299, 1944,H abana, Cuba.

21. León Blanco, F.: Comunicación personal.

22. Mesa Ramos, J.: Reunión del 17 de febrero de 1954 del Cuerpo Médico del Servicio de Dermatología y Sifilografía del Hospital Universitario Calixto García, Dr. Vicente Pardo Castelló, Dr. Pastor Fariñas y Dr. Arturo Dubé.

23. Mesa Ramos, J.: Un caso interesante de pitiriasis versicolor; Rev. Sif., Lepr. Derm. Año **4,** 2, Abril de 1947, Habana, Cuba.

24. Palomino, J. de Castro & Armenteros, J. A.: Abcesos hipodérmicos metástásicos de Cromoblastomicosis; Rev. Sif. Lepr. Derm. Año **4,** 2, 63—72, Abril 1947, Habana, Cuba.

25. Pardo, O. A., Pardo Castelló, V. & Tucker, H. A.: Histoplasmina, Coccidioidina y Tuberculina; Sensibilidad en Cuba; Bol. Ofic. Sanit. Panamer., Junio 1952.

26. Ramos da Silva, Juan: Trabajo presentado en el III Congreso Ibero Latino Americano de Dermatología, Octubre 21—27, 1956.

27. Revilla, J. M. & Vidal, R.: La jalea de propionato en el tratamiento de la micosis vaginal; Med. Lat. año **9,** 2, pp 153—159, Abril-Junio 1950.

28. Río León, E.: Contribución al estudio de las tiñas tricofíticas en Cuba; con descripción de 32 casos producidos por un Trichophyton mentagrophytes. — Bol. Col. Med. Habana, Vol. **2,** No. 5, Mayo, 1951, pp. 163—174.

29. Sanguily, J., Fernández, O. & León Blanco, F.: Histoplasmosis en Cuba; reporte de un caso con breve revision de la literatura; Arch. Soc. Estud. Clin. Habana, **XLIV,** 3, Mayo-Junio 1951.

30. Silva, Ramos, J. E.: III Congreso Ibero Latino Americano de Dermatologia. Ciudad Mexico 21—27 Octubre 1956.

31. Vidal, R.: Actinomicosis: Diagnóstico micológico; Rev. Cub. Lab. Clin. **1,** 49—62, Abril-Mayo-Junio 1947.

32. Vidal, R.: Diagnóstico micológico de las tiñas del cuero cabelludo. Rev. Cub. de Lab. Clin. Vol. **6,** No. 2, pp. 416—422, 1952.

33. Vanbreuseghem, R.: Mycose cérébrale par Cladosporium trichoides chez un indigène du Congo belge, par Chr. Lucasse, J. Chardome and P. Magis. Note Mycologique sur Cladosporium trichoides Emmons 1952; Ann. Soc. Belg. Med. Trop. **XXXIV,** 4, 1954.

REVISION CRÍTICA DE LA INVESTIGACIÓN Y DE LA LITERATURA MICOLÓGICA EN EL URUGUAY EN EL PERÍODO 1946-1956.

por

JUAN E. MACKINNON

(25.II.1958)

Los trabajos publicados se refieren a micología aplicada o tienen muy estrecha relación con ella. Dividiré esta exposición en los siguientes capítulos: Micología fitopatológica, Micología médica, Micología veterinaria, Micología industrial y Varios.

MICOLOGÍA FITOPATOLÓGICA

Destacaremos en primer lugar una lista de las enfermedades de los vegetales en el Uruguay preparada por KOCH DE BROTOS & BOASSO (1955) que comprende las plantas cultivadas y silvestres. Un índice alfabético de 28 páginas con los nombres de agentes y hospederos y los nombres vulgares y científicos de las enfermedades hacen que este obra sea de real utilidad. El bajo número de 230 enfermedades por hongos traduce el criticismo de los autores que convierte a su obra en una seria base de referencia.

BOERGER (1952) refiere que la variedad 284 de *Lolium multiflorum* obtenida en "La Estanzuela", Uruguay, es resistente no sólo a *Schizaphis graminum*, conocido como "pulgón verde", sino tambien a la roya por *Puccinia coronata.*

BOASSO & LEVINE (1952) determinan las razas fisiológicas de *Puccinia rubigovera tritici* causantes de la roya anaranjada del trigo. Entre 93 aislaciones del Uruguay determinan 27 razas.

BOERGER (1953) realiza una interesante exposición sobre las bases teóricas ofrecidas por la genética para las selecciones de razas de vegetales resistentes a las enfermedades y sobre la importancia de los "centros de genes" y de la flora silvestre en general como reservorios de genes necesarios para corregir defectos de la constitución genotípica de las plantas cultivadas. Proporciona ejemplos clásicos y una muy sumaria síntesis de sus propios trabajos en el Uruguay.

RAMÓN-ACOSTA & BOASSO (1953) describen la primera observación en el Uruguay de roya, *Puccinia helianthi*, en el girasol *Helianthus annuus.*

TOBLER (1946) estudia el carbón del trigo por *Tilletia* spp en los siguientes aspectos: influencia de los distintos grados de infección de la simiente en el desarrollo de la epifitia y eficiencia del carbonato de cobre al 2 por mil para evitarla. Experimentando sobre tres variedades de trigo una resultó inmune. El carbonato de cobre al 2 por mil fué eficiente mientras el grado de infeccíon no sobrepasó cierto límite y las muestras de trigo infectadas con baja cantidad de esporos se comportaron como sanas.

Mazzei (1949a) describe técnica para determinar la cantidad de esporos de *Tilletia levis* en granos de trigo. Los granos son lavados con etanol y los esporos recogidos por filtrado en papel de filtro de una determinada superficie. Mediante un fotómetro se midió la luz reflejada y luego de aclarar con xilol el papel de filtro se realizó el conteo de los esporos bajo el microscopio. En 93 muestras de infeccíon visible 1,000 a 10,000 esporos por semilla fueron hallados. Por debajo de 1,000 esporos el método microscópico fué obligado.

Canel & Fischer (1949) refieren que 53,2 % de las plantas de maíz castradas dieron muestra de infección hor *Ustilago zeae* o "carbón" en tanto que en las plantas no mutiladas el índice fué de 1,2 %. Se discute el modo de acción de la injuria.

Gheorghianov & Fischer (1952) afirman que en el Uruguay 5 % de las plantas de maíz muestran signos de infección por *Ustilago zeae* que se traduciría en una merma del 2 % de las cosechas. Existiría un equilibrio entre la agresividad del hongo y las variedades de maíz cultivadas en los países del Rio de la Plata. La alteración del equilibrio inducido por factores meteorológicos constituye amenaza latente que en el año seco 1949—1950 se hizo patente. La infección experimental de la semilla no aumentaría la intensidad de la epifitia.

Bertelli (1947 y 1948) estudió la anatomía patológica de las lesiones gomosas de las ramas del duraznero, *Prunus persica*, producida por causas mecánicas, parasitarias y por hongos. Hace estudios histopatológicos de los procesos debidos a *Phomopsis* sp., *Cladosporium carpophillum*, *Ascospora beijerinckii*, etc. Estas publicaciones estan ilustradas con numerosas fotografías.

Varios trabajos de divulgación práctica han sido publicados y citaremos entre ellos siguirentes: Bertelli (1946) escribe sobre los síntomas de las más frecuentes enfermedades del lino y de los cereales y manera de combatirlas. Mazzei (1949b) trata de las plagas de los frutales y el mismo autor (1950) sobre el contralor del ataque de la vid por la antracnosis debida a *Gloeosporium ampelophagum* destacando la importancia del descalce y limpieza de las cepas previo al uso de fungicidas.

MICOLOGIA MEDICA

Para mejor orientación del lector dividiremos este capítulo en las necesarias secciones.

Agentes de micetomas

(Maduromicosis, micetomas exógenos actinomicósicos y actinomicosis)

Desde 1946 se dedicó especial atención a los agentes de maduromicosis porque se pensó que era el capitulo más confuso de la micología médica. Estos trabajos se consideró eran indispensables para posteriores estudios sobre la terapia específica de los micetomas. MACKINNON, FERRADA-URZÚA & MONTEMAYOR (1949a y 1949b) aprecian las similitudes entre cinco cultivos aislados de casos de „pie de Madura" con granos negros an Argentina, Chile, Paraguay y Venezuela. No pudiendo identificar los cultivos a especies conocidas fué necesario crear la nueva designación *Madurella grisea.* La especie había sido ya observada en India (Cent. f. Bakt. I, 61, 358, 1912 y British J. Surg., 27, 256, 1939) y fué hallada luego en Estados Unidos, Brasil y Congo Belga.

Posteriormente MACKINNON (1951b) e studió el grupo constituído por *Madurella americana* y *M. ikedae* comparando estas especies con cultivos aislados en Sudan y Somalía Británica conservados en la „London School of Hygiene and Tropical Medicine" con el nombre *Madurella mycetomi* (LAVERAN). Se comprobó la identidad y se adoptó el nombre *M. mycetomi* para los cultivos de ese grupo. MACKINNON (1951a) estudió tambien los agentes de maduromicosis de granos blancos admitiendo a *Cephalosporium falciforme* y *Allescheria boydii* (= *Monosporium apiospermum*) como buenas especies. La obtención de más material de estudio permitió a MACKINNON (1954) describir las características en cultivo y en estado parasitario de los agentes más comunes de maduromicosis, que no serían más de cinco, así como establecer su sinonimia y con VIDAL (1954) enunció los caracteres diferenciales entre los gránulos de *M. mycetomi* y los de *M. grisea. M. mycetomi* produce gránulos vegetativos y escleróticos. Notas complementarias publicó MACKINNON (1951c y 1955). Paralelamente se realizaron estudios sobre los actinomicetos productores de mocetomas de origen exógeno cuyo resultado es publicado en 1956 (Tr. Roy. Soc. Trop. Med. & Hyg., 50, 31, 1956).

ARTAGAVEYTIA-ALLENDE (1950) presentó documentación bibliográfica del origen dentario de dos casos de actinomicosis cérvicofaciales debidas a *Actinomyces bovis* (= *A. israeli*). CANCELA-FREIJO, HOUNIE & STAPFF (1950) afirman que los casos que han observado son habitualmente de origen dentario. FRANCHI-PADÉ, OEHNINGER, LIBEROFF & Stanham (1955) presentan un caso de actinomicosis por *A. bovis* con lesiones pulmonares, musculares, renales y cerebrales.

Aspergilosis

AMARGÓS, MENÉNDEZ & SOTELO (1951) observaron un caso de aspergilosis pulmonar y cardíaca comprobando en la necropsia intensa fibrosis pulmonar y pleural y granulaciones en el corazón. El estudio micológico fué hecho por MACKINNON, FERRADA-URZÚA & MONTEMAYOR (1949b) que observaron conidióforos típicos de *Aspergillus fumigatus.* El hongo formaba en los broquiolos gránulos blancos semejantes a los que se ven en las maduromicosis. Los bronquiolos muy alterados por la fibrosis y pérdida percial del epitelio dejaban en su lugar pequeñas cavidades con pus y gránulos. Se compara esta observación con las clásicas de KOHN y DE BOYCE. Los granulomas en el miocardio contienen restos de elementos micelianos que no prosperan en esas condiciones. En otra publicación he discutido (1949c) la posición de las aspergilosis en la clasificación de las micosis de Henrici en la que ocuparían un lugar intermedio entre las superficiales y las profundas.

Esporotricosis

La enfermedad no es rara en el Uruguay. ERRECART (1946) observó 27 casos en una limitada región del Uruguay, Flores. ERRECART hizo examen directo en fresco en dos casos observando así la forma "asteroides" del hongo en los tejidos. Los casos registrados son casí todos de la forma linfangítica nodular o de lo contrario se asemejan a otras dermatitis verrucosas. El autor afirma que tres enfermos se curaron espontáneamente, sin tratamiento. ANTIGA (1954) observa siete casos en la localidad de "Treinta y Tres" de los cuales cinco trató con ioduro de potasio con éxito y los otros dos casos con aureomicina los primeros días y luego con ioduro siendo la mejoría registrada desde los primeros días antes de la administración de ioduro. FERNÁNDEZ, PERDOMO DE FERNÁNDEZ & DÁVILA (1947) publicaron la observación de un caso con abcesos dermo-epidérmicos diseminados, sin lesiones viscerales aparentes y del cual se aisló un hongo que los autores identifican a *Sporotrichum schenckii*. Se afirma que se observó rápida mejoría mientras se hacía tratamiento con penicilina y sulfatiazol que fué seguido de tratamiento con ioduro de potasio en dosis bajas. MACKINNON (1948a) analizó 46 casos en sus características clínicas: son formas localizadas generalmente en los miembros superiores, poco frecuentemente en los miembros inferiores y rara vez en la cara. El mismo (1950b) recoge 96 observaciones.

MACKINNON (1948b y 1949a) determinó la fecha aproximada o exacta de la contaminación de los enfermos en 32 ocasiones. Llega a la conclusión de que la enfermedad se produce por pequeños brotes en períodos de acentuada humedad, próxima a la saturación de varios días de duración, con temperaturas poco variables durante el día y la noche entre 16 y 20 °C. Estos períodos, con nieblas y lluvias, pueden producirse en cualquier época del año en el Uruguay pero son más frecuentes durante el otoño. La mayoría de los enfermos se contaminaron en otoño y principios del invierno. Un pequeño brote de esporotricosis pudo ser prevísto en 1947. Observaciones posteriores de MACKINNON (1949b) confirman las observaciones anteriores pues de 12 casos observados en 1948 y 1949 nueve habíanse contaminado en el otoño y comienzos del invierno. Señala el autor que la contaminación es frecuentemente debida a arañazos de armadillos que son capturados por su apetitosa carne en especial *Dasypus hybridus*.

Mackinnon, Artagaveytia-Allende & Arroyo (1953b) observan intensas reacciones a la inoculación intradérmica de esporotriquina en cuatro sujetos con esporotricosis que no reaccionaron a la coccidioidina, ni a la histoplasmina ni a la paracoccidioidina. La esporotriquina fué usada en la dilución 1 : 1000 y los otros antígenos al 1 : 10. Entre 50 personas sanas dos reaccionaron intensamente a la esporotriquina 1 : 1000 y no a los otros antígenos y se plantea la posibilidad de la existencia de formas subclínicas, viscerales o no, de esporotricosis. Las regresiones espontáncas observadas por Errecart (1946) podrían explicar estos hechos.

Cromoblastomicosis

Montemayor (1948 y 1949) estudió las propiedades biológicas, inclusive la utilización de compuestos nitrogenados e hidrocarbonados, de dos cepas de *Phialophora verrucosa*, una de *P. pedrosoi*, una de *P. compactum*, una de *P. guggenheimia* y además tres cepas de *P. jeanselmei* y dos cepas saprófitas del género *Cladosporium*. Los agentes de cromoblastomicosis mostraron las mismas características biológicas y a su vez se distinguieron nítidamente de las otras especies ensayadas. El autor hace notar las muy estrechas relaciones existentes entre las especies que causan cromoblastomicosis.

Vignale, Montero, Tost & Sanjinés (1955) observan un enfermo con localización en el dorso debida a *P. pedrosoi*. Es el segundo caso descrito en el Uruguay, el primero había sido diagnosticado en 1933 (Arch. urug. med. 5, 201, 1934 y Ann. Parasitologie, 14, 78, 1936). El presente enfermo no habría contraido la enfermedad en el Uruguay sino en las Islas Canarias siendo el primero de esta provincia Española.

Blastomicosis sudamericana

Se ha prestado atención a esta enfermedad, cada vez más diagnosticada en el Uruguay, y a su agente *Paracoccidioides brasiliensis*. Citaremos en primer lugar publicaciones que demuestran la unidad etiológica de la blastomicosis sudamericana. Artagaveytia-Allende & Montemayor (1949) estudian el cultivo original de *Paracoccidioides cerebriformis* Moore que además de ser muy diferente de *P. brasiliensis* no mostró acción patógena experimental y se presume que se trata de un contaminante. Artagaveytia-Allende & García-Zorrón (1948) demuestran la identidad de *Paracoccidioides tenuis* con *P. brasiliensis*. Artagaveytia-Allende & Montemayor (1949) demuestran la identidad de un cultivo de *Glenosporella* (*Paracoccidioides*) *loboi* aislado de un caso de "Enfermedad de J. Lobo" con *P. brasiliensis*.

Varias publicaciones se refieren a la morfología de la forma parasitaria de *P. brasiliensis*. Mackinnon, Montemayor & Vinelli (1949) consideran equivocadas las descripciones, corrientes en los textos, que asignan una gruesa cápsula a la forma parasitaria cuando en realidad sólo existe una fina membrana que no se tiñe con los comunes métodos histológicos y el panóptico. La apariencia de gruesa cápsula se debe a que debajo de la membrana existe un espacio vacío debido a la retracción del citoplasma o a la plasmólisis y en consecuencia un grueso halo incoloro rodea a la parte teñida. MACKINNON & VINELLI (1949) comprueban estos mismos hechos en cultivos de la forma levadura. MACKINNON & GURRI (1950a) ponen en evidencia la membrana en preparaciones tratadas con el carbonato de plata y observan durante la multibrotación que los fenómenos que ocurren en la membrana no se distinguen de los que ocurren en la brotación simple. MACKINNON (1950a) estudia una mucorácea capaz de multiplicarse por multibrotacíón en condiciones especiales y observa que la multibrotación se hace partiendo de los clamidoesporos y no de los esporangios y además que la membrana de los clamidoesporos se tiñe con el carmín de Best lo mismo que la membrana de la forma multibrotante de *P. brasiliensis*. La membrana de los esporangios no es carminófila. No se hacen deducciones de orden taxonómico.

MACKINNON & VINELLI (1950) tiñen con el carmín de Best la membrana de la forma parasitaria de *P. brasiliensis* y de *Blastomyces dermatitidis*. VINELLI (1950) obtiene resultados semejantes en cultivos levaduriformes. La membrana de B. *dermatitidis* es tres o cuatro veces más gruesa que la de *P. brasiliensis* y en consecuencia es posible distinguir la blastomicosis sudamericana de la norteamericana aun en el caso que en el material examinado no existan formas multibrotantes. El único caso de blastomicosis norteamericana o "Enfermedad de Gilchrist" señalado en el Uruguay (Arch. urug. med. 3, 177, 1933) sería un caso de blastomicosis sudamericana.

En otras publicaciones MACKINNON, GURRI & VINELLI (1950a y 1950b) resumen sus observaciones sobre la membrana de la forma parasitaria de agentes de varias micosis profundas.

A dos casos conocidos antes de 1946 se deben agregar los siguientes a la casuística uruguaya: tres observaciones de CANCELA-FREIJO (1948), una de CANCELA-FREIJO, HOUNIE & STAPFF (1950), dos de HOUNIE & CANCELA-FREIJO (1954) y otra de HOUNIE (1955). En los nueve casos las lesiones orofaríngeas fueron las que orientaron el diagnóstico como en la histoplasmosis. En siete de los nueve casos existían lesiones pulmonares al examen radiológico. Siete nuevos casos de blastomicosis sudamericana se han diagnosticado en 1956 y 1957. Consideramos digna de destacar la observación por HOUNIE (1955) de una recidiva luego de 10 años de aparente curación con sulfamidas.

Se ha prestado atención tambien al aspecto epidemiológico de la enfermedad y a conocer el espectro de la infección paracoccidioidica. MACKINNON, ARTAGAVEYTIA-ALLENDE & ARROYO (1953a) prepararon antígenos para probarlos en reacciones intradérmicas. Se realizaron pruebas en cobayos sanos y en cobayos infectados con *Paracoccidioides brasiliensis*, *Histoplasma capsulatum*, *Coccidioides immitis*, *Sporotrichum schenckii* y *Mycobacterium tuberculosis*. Los antígenos preparados con suspensiones fueron inutilizables por producir falsas reacciones en cobayos sanos. Se usaron filtrados de cultivos de la forma levaduriforme que fueron más ricos en antígenos que los de la forma filamentosa, pudiendo así ser usados diluídos al 1 : 10 y 1 : 100. Los filtrados no diluídos no son inocuos para el animal sano. El antígeno diluído debe ser usado inmediatamente pues es lábil. No se observó reacción cruzada con la tuberculosis. De 19 cobayos inoculados con *P. brasiliensis* 14 reaccionaron a la paracoccidioidina 1 : 100. Usando la paracoccidioidina al 1 : 100 no observaron reacciones positivas entre 31 cobayos inoculados con *C. immitis*, 19 con *H. capsulatum* y 18 con *S. schenckii* pero cuando se usó la dilución 1 : 10 aparecen algunas reacciones positivas. Se observó tambien que algunos cobayos sensibilizados a *P. brasiliensis* reaccionaron debilmente a la histoplasmina. Se realizaron pruebas en tres enfermos con blastomicosis sudamericana y sólo uno de ellos, en pausa clínica de más de cinco años, reaccionó a la paracoccidioidina siendo negativas las pruebas con coccidioidina, histoplasmina y esporotriquina. Cuatro enfermos con esporotricosis que reaccionaban intensamente a la esporotriquina 1 : 1000 no reaccionaron a la paracoccidioidina 1 : 10.

En vista de los resultados enunciados más arriba los autores decidieron realizar encuestas en el hombre y como en el Uruguay no existe la coccidioidomicosis se realizaron pruebas simultáneas solamente con la histoplasmina. Entre 537 personas sanas 11 reaccionaron a la paracoccidioidina y 58 a la histoplasmina. Entre los 11 reactores a la paracoccidioidina había nueve reactores a la histoplasmina con mayor intensidad. Los dos reactores negativos a la histoplasmina y positivos a la paracoccidioidina eran personas que habitaban a orillas de ríos preparando carbón de leña y cumpliendo otras tareas que obligaban a vivir en zonas con árboles típicos de la flora autóctona. En una localidad próxima a bosques y donde se había registrado un caso de blastomicosis sudamericana se realizó pequeña encuesta entre 28 personas y se halló dos reactores a la paracoccidioidina y negativos a la histoplasmina. De los siete casos conocidos en el Uruguay en 1953 cinco habían vivido en zonas similares. De estas encuestas los autores dedujeron que la enfermedad se adquiere en el Uruguay generalmente en zonas limitadas y que existirían formas inaparentes de la infeccíon paracoccidióidica o de muy lenta evolución cuyo estudio clínico está por ser realizado.

Histoplasmosis

Mackinnon & Gurri (1950b) colorearon la forma parasitaria de *Histoplasma capsulatum* con el carmín de Best y señalaron que en lugar de la gruesa cápsula incoloreable, habitualmente descrita, existe una fina membrana carminófila y por debajo un espacio claro vacío, probablemente debido a fenómenos de plasmólisis, que la separa del citoplasma. Las formas muertas de histoplasma se ven como vacuolas rodeadas de una membrana carminófila. En las preparaciones teñidas con hematoxilina y eosina estas formas muertas aparecen como simples vacuolas. Los resultados enunciados son idénticos a los observados con el método de HOTCHKISS & McMANUS.

LÓPEZ-FERNÁNDEZ (1952) observó que una levadura identificada por ARTAGAVEYTIA-ALLENDE (1952b) como *Torulopsis glabrata* es capaz de producir experimentalmente en el ratón cuadro histoparasitológico semejante al de la histoplasmosis.

Un nuevo caso es comunicado por CANCELA-FREIJO (1947) quien preparó luego su tesis de doctorado con la base de este caso y del primer caso uruguayo (Arch. urug. med., 24, 193, 1944) asi como de una encuesta en 1,189 personas. Esta última reveló 8,9 % de reactores a la histoplasmina. Fuera de su aporte personal CANCELA-FREIJO realizó en su tesis (1949) una completa y prolija recopilación de los conocimientos sobre histoplasmosis. Entre otras informaciones es interesante la relativa a la acción de las sulfamidas en la histoplasmosis. Un enfermo tratado y aparentemente curado tuvo una recidiva cinco años después y un nuevo tratamiento produjo curación de las nuevas lesiones orofaríngeas. BUZÓ, OSIMANI, SANTORO, CANON & GURRI (1953) hacen similares apreciaciones respecto a la acción de las sulfamidas. La opinión predominante en el Uruguay es que las sulfamidas son eficientes en ciertos casos crónicos pero que no es prudente esprerar otra cosa que pausas clínicas.

El tercer caso de histoplasmosis en el Uruguay es comunicado por CANCELA-FREIJO, HOUNIE & STAPFF (1950), el cuarto caso por BUZÓ, OSIMANI, SANTORO, CANON & GURRI (1953) quienes ademas hacen referencia a otros dos casos no publicados. Posteriormente dos nuevos casos han sido observados. Se trata siempre de casos crónicos en adultos con marcadas lesiones orofaríngeas y viscerales. Es de suponer que el número real de casos clínicos sea varias veces superior al señalado y es algo desconcertante que la histoplasmosis no halla sido diagnosticada en niños. Por otra parte los estudios epidemiológicos son escasos y no se han hecho encuestas sobre sensibilidad a la histoplasmina en niños. Ya hemos citado que CANCELA-FREIJO (1949) halló 8.9 % de reactores en adultos. MACKINNON, ARTAGAVEYTIA-ALLENDE & ARROYO (1953b) luego de comprobar que la coexistencia de blastomicosis sudamericana en el Uruguay no invalidaría los resultados de las encuestas con histoplasmina, anotan 10.8 % de reactores.

Coccidioidomicosis

ARTAGAVEYTIA-ALLENDE (1949a) realizó un estudio de las propiedades biológicas de varios cultivos de *Coccidioides immitis*.

MACKINNON (1948c) hizo una revisión de los casos sudamericanos conocidos y agrega un nuevo caso originado en el Chaco Paraguayo.

MACKINNON, ARTAGAVEYTIA-ALLENDE, VINELLI, NIÑO, FERRADA-URZÚA, ALONSO & DONOSO (1950) comunicaron los resultados de algunas encuestas realizadas en Argentina, Chile y Uruguay. En un total de 977 personas del Uruguay solo 9 reaccionaron a la coccidioidina y algunas de estas reacciones se deberían a reacciones cruzadas con la histoplasmosis. Simultáneamente comunicaron los resultados en la Argentina (NIÑO & FERRADA-URZÚA) y en Chile (FERRADA-URZÚA, ALONSO & DONOSO). Estas últimas observaciones junto a las de otros autores argentinos y paraguayos permitieron trazar una línea que corre de norte a sur, al oeste de los rios Paraguay y Paraná que marca el límite probable entre las zonas de endemia coccidìóidíca situadas al oeste y las libres de endemia. Será dificil pues hallar un caso de coccidioidomicosis en el Uruguay.

Criptococosis o torulosis

En años anteriores a 1946 varios médicos se habían interesado en algunos elementos, como los cuerpos amiláceos, que en el encéfalo podrían dar lugar a errores si fueran confundidos con levaduras. Estas dudas indujeron al estudio de las reacciones tintoriales propias de la cápsula mucilaginosa del agente de la enfermedad; *Cryptococcus neoformans*. GURRI (1950) recomendó el uso del mucicarmín para colorearla y señaló la utilidad del estudio de la metacromasia con el azul de toluidina. No se ha diagnosticado un caso indiscutible de criptococosis en el Uruguay, pero no hay razones para suponer que la enfermedad no exista en el país. GIUDICE (1946) estudió las alteraciones histológicas del sistema nervioso de ratas inoculadas por vía intracerebral. Usa técnicas histológicas adecuadas.

Rinoesporidiosis

DOMINGUEZ, SELINKE & D'OTTONE (1948) publicaron un caso con localización en las fosas nasales y debido a la intensa reacción plasmocitaria los autores llaman a las lesiones "plasmocitomas". OREGGIA & SCOLNICK (1955) describieron un nuevo caso con idéntica localización. Cuatro casos humanos figuran en la literatura médica uruguaya siendo los dos primeros reconocidos por LASNIER (Bol. Soc. Anat. Patológica, Montevideo, 1, 181, 1930).

Blastomicosis norteamericana

En la sección sobre "Blastomicosis Sudameriana" hemos relatado que MACKINNON & VINELLI (1950) hallaron diferencias entre la membrana de la forma parasitaria de *Blastomyces dermatitidis* que es gruesa, y la de *Paracoccidioides brasiliensis* que es fina. Estas diferencias permitirían reconocer a *P. brasiliensis* cuando sólo se dispone de formas de brotación simple para el diagnóstico. Teniendo como base estos resultados la enfermedad de Gilchrist no habría sido hallada en el Uruguay.

Moniliasis

Mackinnon (1946) publicó un libro titulado "Zimología Médica". La mayor parte fúe dedicada al género *Candida*. Luego de definir el género y discutir su nomenclatura se detallan los caracteres morfológicos y biológicos de las diferentes especies admitidas otorgando especial atención a los fenómenos de variación irreversible cuyo estudio se consideró de gran utilidad para definir las especies y establecer la sinonimia. Se prestó tambien atención al estudio de la acción patógena experimental y del "habitat" de cada especie.

Ferrada-Urzúa (1946) durante su estadía en Montevideo estudió 46 cepas de levaduras del género *Candida* aisladas del hombre en Chile. *Candida albicans* es la especie más frecuente y su aislamiento coincide con la observación de los clásicos cuadros clínicos de moniliasis. *C. tropicalis* es frecuentemente hallada en la espectoración de personas con cuadors bronquiales.

Stapff (1955) publicó sus impresiones sobre las moniliasis orofaríngeas que aparecen luego del uso de antibióticos de reducido o amplio espectro cuando son suados localmente a la manera de tópicos en trociscos, etc. El autor afirmó que halló la especie *C. tropicalis* en 15 casos de 60. Destaca el valor del, violeta de genciana para el tratamiento.

Levaduras varias

En la obra "Zimología Médica" Mackinnon (1946) se refirió no sólo al género *Candida* sino tambien a *Trichosporon, Rhodotorula, Pityrosporum,* y *Torulopsis* (incluído *Cryptococcus*). Fenómenos de variación son referidos en *Trichosporon beigeli* agente de "piedra blanca" y en *Rhodotorula mucilaginosa.* Estos últimos habían sido ya dados a conocer con Artagaveytia-Allende. (Comun. Botan. Museo. Hist. Nat. Montevideo; No. 13, 1944). Se resumen tambien los conocimientos sobre especies patógenas en las que se han descrito esporos. Artagaveytia-Allende (1952a) nuevamente obtiene razas depigmentadas y filamentosas de *Rhodotorula mucilaginosa* ampliando los hallazgos e interpretaciones anteriores.

Artagaveytia-Allende (1952b) hizo un estudio micológico de la especie *Torulopsis glabrata* y especialmente de una cepa aislada por López-Fernández del apéndice de un niño. López-Fernández (1952) estudió la acción patógena experimental de *T. glabrata* para ratones observando cuadros histoparasitológicos semejantes a los que se ven en la histoplasmosis.

Artagaveytia-Allende (1953) comunicó el hallazgo de *Torulopsis pintolopesi* en el peritoneo de ratones confirmando las observaciones de Van Uden publicadas en 1952.

Dermatófitos y tiñas

Mackinnon (1950b) confirmó y actualizó las conclusiones de Talice & Mackinnon (Arch. urug. med., 2, 537, 1933) referentes al cuadro etiológico de las tiñas en el Uruguay con la base de una experiencia ampliada a 738 observaciones. De 440 casos de tiña del cuero cabelludo 361, es decir el 82 %, eran tiñas microespóricas. Se determinó la especie causal en 321 casos y se observó que 319 cultivos pertenecían a la especie *Microsporum canis* y dos a *M. gypseum.* A pesar de que se prestó especial atención a la búsqueda de *Microsporum audouini* esta especie no fué hallada y más del 99% de los casos de tiña microespórica en el Uruguay fueron debidos a *M. canis.* Esta especie fué aislada tambien de perros y gatos y Borelli (1954) la halló en cobayos. Treinta y cinco casos de tiña del cuero cabelludo, 7.95 %, se debieron a tricofitones endotrix y las especies causales fueron: *Trichophyton violaceum* en 17 oportunidades, *T. epilans* (= *T. tonsurans*) en 8, *T. sabouraudi* en 7 y no se determinó la especie en tres casos. Se opinó que *T. epilans* es sinónimo de *T. tonsurans* lo cual es admitido hoy en día aunque tambien se incluye *T. sabouraudi* en la sinonimia de *T. tonsurans.* Siguiendo esta nomenclatura de los 35 casos 17 habrían sido producidos por *T. violaceum,* 15 por *T. tonsurans* y en tres no se determinó la especie.

Quince casos de tiña del cuero cabelludo, 3.4 %, ectotrix con pequeños esporos, fueron debidas a *Trichophyton mentagrophytes.* Otros 17 casos, 3.8 %, eran tiñas inflamatorias por ectotrix megaesporados y se logró obtener cultivos en cinco oportunidades tratandose de *Trichophyton album* (= *T. verrucosum*). Solamente 12 casos de tiña fávica (2.7 %) fueron diagnosticados y se aisló T. *schönleini.* Otros casos de esta tiña se registraron en extranjeros.

De 18 casos de tiña de la barba 8 fueron debidos a *T. mentagrophytes,* 8 a T. *album* o *T. verrucosum* y uno a *T. rubrum.*

Se anotaron 215 casos de tiñas de la piel como herpes circinados, foliculitis agminadas, etc. y se identifican como agentes: *Microsporum canis* en 117 oportunidades, *T. album* (= *verrucosum*) en 19 oportunidades tratándose de casos inflamatorios en su mayoría, *T. mentagrophytes* fué identificado en 11 ocasiones y las siguientes especies dos veces cada una: *T. tonsurans, T. violaceum, T. equinum, Microsporum gypseum* y *Epidermophyton floccosum.* En otros siete casos con lesiones eritemato-escamosas diseminadas generalizadas se aisló *Trichophyton rubrum.*

De 54 casos de pié de atleta se aislaron las siguientes especies: *Trichophyton mentagrophytes* en 25 oportunidades, *Epidermophyton floccosum* en 8 y *Trichophyton rubrum* en 7.

Se estudiaron 14 casos de tiña de las manos hallando *T. mentagrophytes* en 7 casos, *T. rubrum* en dos *E. floccosum* en uno y *T. album* (= *T. verrucosum*) en tres. En estos tres últimos casos el contacto directo con animales vacunos o bien con sus productos, como la cerda, había sido la causa.

De 20 casos de eczema marginado se aisló *Epidermophyton floccosum* en 9 oportunidades, *T. mentagrophytes* en 4 y *T. rubrum* en dos.

Finalmente se aisló *T. rubrum* de tres casos de onixis.

De los 738 casos de tiña lo menos 523 habrían sido producidas por especies de los animales destacándose *Microsporum canis* del perro y del gato en 476 oportunidades y *Trichophyton verrucosum* (= *T. album*) del ganado en 47.

Otras micosis superficiales de la piel

En la publicación de MACKINNON (1950b) aparecen los siguientes datos. Se observaron 28 casos de "piedra negra" por *Piedraia hortai* procedentes de la parte norte del Uruguay en su gran mayoría.

La pitiriasis versicolor es frecuente y entre 1000 casos de micosis cutáneas 37 eran debidas a *Malassezia furfur.*

El eritrasma es rara vez observado figurando 7 casos. Además se observó 10 casos de tricomicosis axilar o triconocardiosis siendo 9 de la variedad *flava* y una de la variedad *rubra.*

De casos típicos de *erosio interdigitalis* se aisló *Candida albicans. Candida albicans, C. tropicalis* y *C. parapsilosis* fueron halladas en casos de perionixis pero *C. albicans* es la especie más frecuentemente aislada. De casos de onixis sin perionixis, con levaduras, la especie *Candida parapsilosis* sería la aislada más frecuentemente pues fué aislada tres veces en cinco casos.

MICOLOGIA VETERINARIA

MACKINNON & ARTAGAVEYTIA-ALLENDE (1948a) publicaron un estudio sobre las necesidades en vitaminas de siete cepas de tricofitones megaesporados aislados de animales vacunos o de humanos que habían contraido la enfermedad por contacto con vacunos. Se llega a la conslusión de que las tres especies faviformes de SABOURAUD, *Trichophyton album, T. discoides* y *T. ochraceum* pueden ser variedades de una sola y en tal caso el nombre T. *album* tendría la prioridad. Esta tedencia unicista goza de favor en la actualidad aunque segun AINSWORTH & GEORG (Mycologia, 46, 9, 1954) *T. album* sería a su vez un sinónimo de *Trichophyton verrucosum.* Desde el punto de vista de las necesidades en vitaminas se destaca que entre cinco cepas con el aspecto correspondiente a *T. discoides* tres eran completamente deficientes en inositol, una en tiamina y otra en tiamina, inositol y piridoxina. De dos cepas con el aspecto de *T. ochraceum* una era deficiente en tiamina e inositol y la segunda en tiamina solamente. En una segunda publicación se discute más explicitamente (1948b) si desde el punto de vista taxonómico las diferencias citadas podrían ser utilizadas como criterio para distinguir especies pero se manifiesta una opinión negativa y se opina que la vida parasitaria ha permitido la preservación de razas deficientes.

MACKINNON (1950b) señala que *Misrosporum canis* ha sido aislado de perros y gatos; *Trichophyton verrucosum* de terneros aunque recordamos que usa el nombre *T. album*; *T. equinum* de caballos y *T. mentagrophytes* de cobayos, BORELLI (1954) aisló *Microsporum canis* de cobayos, durante su estadía en Montevideo.

Hemos diagnosticado tambien aspergilosis de aves por *Aspergillus fumigatus* y dos casos de rinoesporidiosis (no publicados) en equinos.

CASSAMAGNAGHI (1949) relata la observación de moniliasis del tubo digestivo en palomas tuberculosas.

Dos publicaciones de ECHENIQUE (1950) y de ECHENIQUE & TEDESCO (1951) se refieren a graves enfermedades con elevada letalidad en ovinos y bovinos que designan con los nombres "Micosis ovina" y "Micosis bovina". Los autores parten del concepto teórico de que un hongo puede reducir su morfología hasta aparecer como una bacteria sin ofrecer ninguna prueba. Así el hongo sería capaz de producir septicemias, etc. En el caso que tratamos el punto de partida sería un dermatófito pero las fotografías presentadas por los autores hacen dudar de esta determinación.

ARTAGAVEYTIA-ALLENDE (1953) aisla la especie *Torulopsis pintolopesi* del peritoneo de ratones.

MICOLOGIA INDUSTRIAL

Con el fin de quitar a las vinazas de grano y de caña de azúcar la acción nociva sobre la vegetación y para obtener un producto de valor para la alimentación de animales BÉRAUD, TORRES & VILLEGAS (1955) cultivan en vinazas tres cepas de *Torulopsis utilis* obtenidas de colecciones de cultivos y otra levadura que creció espontáneamente y que fué identificada como *Candida krusei*. En cultivos groseramente aereados obtienen mejores rendimientos con la cepa de *C. krusei* que adoptan. Habitualmente obtienen entre 1.5 y 4 kgs. de levadura por hectólitro de vinaza pero a veces han logrado hasta 6.2 kgs. La composición química de la masa es: humedad a 105° C 6.68 %; sustancias grasas 3.6 %; sustancias nitrogenadas en N. 6.76 %; proteína total 42.28 %; celulosa 4.74 %; cenizas 6.3 %; extractos no nitrogenados 36.4 %. El valor nutritivo calculado sobre las cifras analíticas es valorado en 67.43 unidades Kellner comparable al de la sangre desecada y harina de pescado. El tenor en tiamina fué de 5.2 µgs por gramo y en riboflavina fue de 152.2 µgs. Los autores seirman que los ensayos de alimentación de pollos "Rhode Island Red" fueron exitosos y en 1956 aparecen publicados ensayos efectuados con el producto (An. Fac. Veterinaria del Uruguay, 6, 49, 1956). Asimismo los autores realizan ensayos en plantas de maíz y de caña de azúcar comprobando por lo menos desaparición de los efectos nocivos.

BERTULLO & HERRERA (1954) refieren la contaminación del pescado seco salado por *Aspergillus niger* y BERTULLO (1955) atribuye a *Sporendonema epizoum* manchas marrones o "pecas" del mismo procucto.

VARIOS

TALICE & M. L. DE TALICE (1948) publican una nueva edición de su "Manual práctico de hongos comestibles". Esta edición trae algunas nuevas planchas en colores representando con fidelidad las especies más comunes de hongos comestibles y venenosos del Uruguay. Se trata de especies no autóctonas creciendo en bosques de árboles importados o bien en los prados. Como lo indica el título es una obra eminentemente práctica destinada al principiante aficionado.

MACKINNON, ARTAGAVEYTIA-ALLENDE & GARCÍA-ZORRÓN (1950) publicaron la lista de cultivos mantenida en la micoteca del Instituto de Higiene de Montevideo. Es una colección relativamente pequeña, en la actualidad se mantienen alrededor de 400 especies, destinada a satisfacer las necesidades de la investigación en el laboratorio así como las de la enseñnanza. Se mantienen sin embargo cultivos de interés para el estudio de la micología general, industrial, etc.

ARTAGAVEYTIA-ALLENDE (1955) preparó un catálogo de las colecciones micológicas latino-americanas que es editado por el "Centro de Cooperación científica para América Latina" de UNESCO.

Summary

I shall try to provide the reader with a guide about some mycological work in Uruguay.

A good list of the diseases of cultivated and wild plants in Uruguay has been prepared by L. KOCH DE BROTOS & C. BOASSO at the "Facultad de Agronomía", Sayago-Montevideo-Uruguay.

Selection of varieties resistant to the attack of fungus diseases are carried out under the direction of G. J. FISHER at an agricultural station: "La Estanzuela", Colonia-Uruguay. The papers on this matter are published in "Archivo Fitotécnico del Uruguay" founded by the late Professor A. BOERGER.

Many papers on fungus diseases of the man have been published and most of this research has been carried out at the "Facultad de Medicina" Montevideo-Uruguay. I shall summarize some results: *Microsporum canis* is the main agent of tinea in Uruguay and *M. audouini* has not been found. *Trichophyton verrucosum* is the causal organism of tinea in cattle and of inflammatory lesions in man. The other superficial skin diseases produced by cosmopolitan fungi have no special characteristics. "Black piedra" by *Piedraia hortai* is diagnosed rather frequently in the north of the country. Sporotrichosis is rather frequent and its incidence ruled by weather conditions. South-American blastomycosis has been diagnosed several times and skin testing with an antigen prepared with cultures of *Paracoccidioides brasiliensis* allows to suspect that there exist subclinical forms and that the infection is acquired in areas with autochthonous plants and animals. Chronic cases of histoplasmosis in adults have been reported and 10.8 % of positive reactors to histoplasmin was found among normal persons. Rhinosporidiosis and chromoblastomycosis are rarely found. Up to the

present day coccidioidomycosis, cryptococcosis and Gilchrists's disease are unknown in Uruguay. Actinomycosis by *Actinomyces bovis* is rather frequent. Cases of nocardiosis by *Nocardia asteroides* are rarely found and only one case of maduromycosis has been recorded. The causal organisms of maduromycosis and of exogenous mycetomas have been studied.

BÉRAUD and collaborators cultivated *Candida krusei* in mollases and used it as food for poultry. (Facultad de Química y Farmacia, Montevideo-Uruguay).

The author remains at the service of the readers for any kind of information regarding to the mycological work, developed in Uruguay. Address: JUAN E. MACKINNON, Instituto de Higiene, Av. Ricaldoni 3051, Montevideo-Uruguay.

Bibliografía

AMARGÓS, A., MENÉNDEZ, H & SOTELO, J. R. (1951) Inst. Inv. Cienc. Biol., Montevideo, **1,** 271—283.

ANTIGA, P. R. (1954) Rev. Médica del Este, **20,** 50—52.

ARTAGAVEYTIA-ALLENDE, R. C. (1949a) Mycopathologia, **4,** 375—378.

— (1949b) J. Dent. Res., **28,** 242—247.

— (1950) An. Inst. Hig. Montevideo, **3,** 137—141.

— (1952a) Arch. Soc. Biol. Montevideo, **19,** 37—43.

— (1952b) An. Fac. Med. Montevideo, **37,** 467—469.

— (1953) Arch. Soc. Biol. Montevideo, **20,** 37—43.

— (1955) Segundo catálogo de colecciones micológicas Latino- americanas. 111 páginas. Montevideo.

— & GARCÍA-ZORRÓN, N. (1948) An. Inst. Hig. Montevideo, **2,** 69—73.

— & MONTEMAYOR, L. (1949) Mycopathologia, **4,** 356—366.

BÉRAUD, P., TORRES, N. & VILLEGAS, D. (1955) An. Fac. Quím. Farm. Uruguay, **4,** 255—264.

BERTELLI, J. C. (1946) Rev. Asoc. Ing. Agrónomos, Uruguay, **73,** 9—32.

— (1947) *Ibid.*, **78,** 11—32.

— (1948) *Ibid*, **82,** 9—32.

BERTULLO, V. H. (1955) An. Fac. Veter, Uruguay, **6,** 39—45.

— & HERRERA, M. (1954) *Ibid.*, **6,** 61—66.

BOASSO, C. & LEVINE, M. N. (1952) Arch. Fitotécnico del Uruguay, **5,** 21—31.

BOERGER, A. (1952) *Ibid*, **3,** 155—156.

— (1953) Rev. Asoc. Ing. Agrónomos, Uruguay, **93,** 7—33.

BORELLI, D. (1954) Comunicación personal.

BUZÓ-RODRIGUEZ, T., OSIMANI, J. J., SANTORO, A., CANON, E. & CURRI, J. (1953) Arch. urug. med., **43,** 277—292.

CANCELA-FREIJO, J. (1947) Hoja Tisiológica, Montevideo, **7,** 207—211.

— (1948) *Ibid.*, **8,** 89—101.

— (1949) An. Fac. Med. Montevideo, **34,** 1049—1152.

— HOUNIE, P. & STAPFF, V. (1950) Segundo Cong. Panam. Otorinol. y Bronco-esofagol., 181—205.

CANEL, M. & FISCHER, G. J. (1949) Arch. Fitotécnio del Uruguay, **4,** 18—19.

CASSAMAGNAGHI, A. (1949) Rev. Med. Veterinaria, Montevideo, **4,** 925—928.

DOMINGUEZ, C. M., SELINKE, H. & D'OTTONE, L. (1948) An. Fac. Med. Montevideo, **33,** 1200—1207.

ECHENIQUE, L. (1950) Rev. Med. Veterinaria, Montevideo, **15,** 987—1007.

— & TEDESCO, L. F. (1951) *Ibid*, **5,** 1079—1090.

ERRECART, L. M. (1946) Arch. urug. med. **28,** 249—253.

FERNÁNDEZ. G. J., PERDOMO DE FERNÁNDEZ, C. & DÁVILA, L. (1947) Rev.Clín. méd., Montevideo, **1**, 119—127.

FERRADA-URZÚA, L. V. (1946) Hoja Tisiológica, Montevideo, **6**, 329—337.

FRANCHI-PADÉ, J., OEHNINGER, C., LIBEROFF, M. & STANHAM, J. (1955) An. Fac. Med. Montevideo, **40**, 28—41.

GHEORGHIANOV, V. & FISCHER, G. J. (1952) Arch. Fitotécnico del Uruguay, **3**, 119—129.

GIUDICE, D. (1946) An. Fac. Med. Montevideo, **31**, 100—113.

GURRI, J. (1950) *Ibid.*, **35**, 1—8.

HOUNIE, P. (1955) An. Otorinolaringología del Uruguay, **24**, 141—151.

— & CANCELA-FREIJO, J. (1954) *Ibid.*, **23**, 75—84.

KOCH DE BROTOS, L. & BOASSO, C. (1955) Lista de las enfermedades de los vegetales en el Uruguay. Publ. No. 106 de la Dirección de Agronomía. 65 páginas. Imp. América, Montevideo.

LÓPEZ-FERNÁNDEZ, J. R. (1948) An. Inst. Hig. Montevideo, **2**, 36—43.

— (1952) An. Fac. Med. Montevideo, **37**, 470—483.

MACKINNON, J. E. (1946) Zimología Médica. 160 páginas. Imp. ,,El Siglo Ilustrado'' Montevideo.

— (1948a) An. Inst. Hig. Montevideo, **2**, 44—49.

— (1948b) *Ibid.*, **2**, 50—68.

— (1948c) *Ibid.*, **2**, 74—84.

— (1949a) Mycopathologia, **4**, 367—374.

— (1949b) An. Inst. Hig. Montevideo, **3**, 127—129.

— (1949c) Hoja Tisiológica, Montevideo, **9**, 321—329.

— (1950a) An. Fac. Med. Montevideo, **35**, 653—668.

— (1950b)An. Inst. Hig. Montevideo, **3**, 83—94.

— (1951a) An. Fac. Med. Montevideo, **36**, 153—180.

— (1951b) *Ibid.*, **36**, 197—210.

— (1951c) Ciencia e Investigación, Buenos Aires, **7**, 77—78.

— (1953) Sixth Int. Cong. Microbiol., Roma, **5**, 153—154.

— (1954) Tr. Roy. Soc. Trop. Med. & Hyg., **48**, 470—480.

— (1955) *Ibid.*, **49**, 470.

— & ARTAGAVEYTIA-ALLENDE, R. C. (1948a) J. Bact., **56**, 91—96.

—, — (1948b) An. Inst. Hig. Montevideo, **2**, 11—31.

—, — & ARROYO, L. (1953a) An. Fac. Med. Montevideo, **38**, 363—382.

—, — — (1953b) *Ibid.*, **38**, 428—445.

—, — & GARCÍA-ZORRÓN, N. (1950) An. Inst. Hig. Montevideo, **4**, 185—197.

—, —, VINELLI, H., NINO, F. L., FERRADA-URZÚA, L. V., ALONSO, G. & DONOSO, R. (1950) An. Fac. Med. Montevideo, **35**, 1117—1137.

—, FERRADA-URZÚA, L. V. & MONTEMAYOR, L. (1949a) Mycopathologia, **4**, 384—393.

—, — — (1949b) An. Fac. Med. Montevideo, **34**, 231—300.

— & GURRI, J. (1950a) An. Fac. Med. Montevideo, **36**, 1033—1038.

— — (1950b) *Ibid.*, **35**, 1191—1194.

—, — & VINELLI, H. (1950a) Fifth Int. Cong. Microbiol. Rio Janeiro.

—, — — (1950b) An. Inst. Hig. Montevideo, **4**, 90—91.

—, MONTEMAYOR, L. & VINELLI, H. (1949) An. Fac. Med. Montevideo, **34**, 453—460.

— & VIDAL, S. (1954) Arch. Soc. Biol. Montevideo, **21**, 36—43.

— & VINELLI, H. (1949) An. Fac. Med. Montevideo, **34**, 461—470.

— — (1950) *Ibid.*, **35**, 299—310.

MAZZEI, I. (1949a) Arch. Fitotécnico del Uruguay, **4**, 13—17.

— (1949b) Rev. Asoc. Ing. Agrónomos, Uruguat, **84**, 12—23.

— (1950) *Ibid.*, **91**, 20—29.

MONTEMAYOR, L. (1948) An. Inst. Hig. Montevideo, **2**, 32—35.

— (1949) Mycopathologia, **4**, 379—383.

OREGGIA, J. C. & SCOLNICK, B. B. (1955) An. Otorinolaringología del Uruguay, **15**, 5—11.

Ramon-Acosta, D. & Boasso, C. (1953) Rev. Asoc. Ing. Agrónomos, Uruguay, **93,** 14—16.

Stapff, V. (1955) An. Otorinolaringología del Uruguay, **25,** 185—195.

Talice, R. V. & Talice de M. L. (1948) Manual práctico de hongos comestibles. 2a ed. Imp. Monteverde. Montevideo.

Tobler, B. H. D. (1946) Rev. Asoc. Ing. Agrónomos, Uruguay, **72,** 17—27.

Vignale, B., Montero, E. D., Tost, J. F. & Sanjinés, A. (1955) An. Fac. Med. Montevideo, **40,** 87—92.

Vinelli, H. (1950) *Ibid.*, **35,** 497—502.

CRITICAL SURVEY OF MYCOLOGICAL RESEARCH AND LITERATURE FOR THE YEARS 1946-1956 IN HOLLAND.

by G. Cremer M. D.

(*From the Department of Dermatology and Venereology* (*Head*: *Prof.* J. R. Prakken *M. D.*) *of the University of Amsterdam* (*Binnengasthuis*).)

(7. III. 1958).

Introduction.

Giving a survey of a decennium of publications in one country brings together articles dealing with diverging subjects, even when they include only fungus diseases. Although classifying these articles will make an impression of artificiality, the general picture will benefit by it. Therefore the articles were classified under the following headings:

1. Laboratory investigations
2. Clinical investigations, subdivided in articles dealing with tinea capitis, tinea pedis (diagnostic and therapeutic), candidiasis and deep mycoses.
3. General articles.

1. Laboratory investigations.

Important laboratory investigations were made by Tio Biauw Sing. This author and Verhagen (1949) [1]) compared the fungistatic action of several fatty acids with other chemicals now known as antimycotics, such as salicylic and benzoic acid., dyes, sulfa's and Hg compounds. They used the agar-hole method and found caproic-, caprylic-, capric-, and lauric acid to have a favourable antimycotic action on *Trichophyton mentagrophytes* (Robin) Blanchard as compared with older fungicides. During these tests it appeared by cultivation on Sabouraud-agar plates, that there were obvious differences between the fungistatic action of fatty acids and sulfanilamide on fungi, which had frequently been in contact with these substances, and on fungi from fresh cultures (fig. 1).

In a second paper Tio Biauw Sing (1949) [2]) tried to find an explanation for the last phenomenon, studying experimentally if a resistance could be developed in *Trichophyton mentagrophytes*, *Trichophyton interdigitale* Priestley and *Trichophyton sulfureum*, towards a mixture of capronic-, caprylic-, capric- and lauric acid (Curamycon) and sulfanilamide. In this he was successful by cultivating on Sabouraud-agar plates, containing the fungicide in increasing concentration; alternating this with suspending the

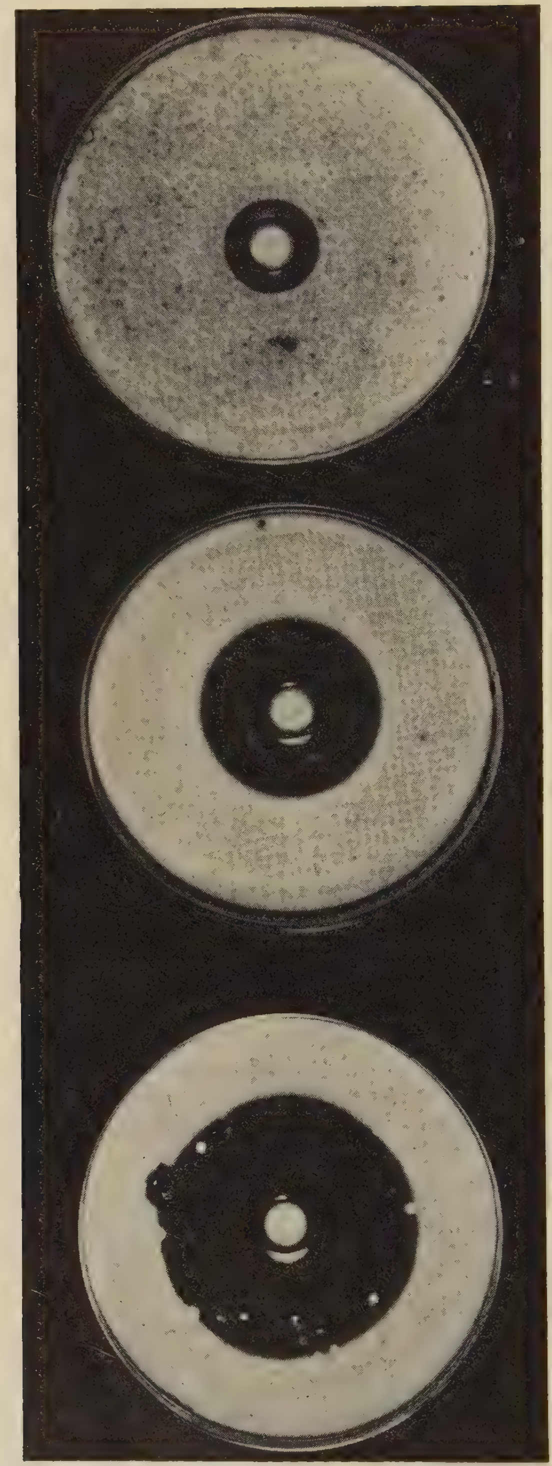


Fig. 1. Development of the resistance of *Trichophyton mentagrophytes*; (a) fresh culture; (b) after 1 month; (c) after 3 months. (From: Tio Biauw Sing & B. A. Verhagen, Comparative investigations into the fungistatic action of fatty acids and other antimycotica in vitro. Ned. Tijdschr. geneesk., **93,** 2241—2250 (1949)).

fungus spores for a week in a watery solution of the fungicide in a corresponding concentration. The resistance developed gradually, but to sulfanilamide it increased far quicker than it did to fatty acids. With Curamycon it took 20—24 weeks to obtain the tolerance of a 1/750 concentration, with sulfanilamide a tolerance of 1/200 was reached in about 8—10 weeks. After some time without contact with the fungicide the resistance was lost.

The acquired resistance was specific for the fungicide used in the experiment. It was possible to obtain a double resistance by working at the same time with the two above mentioned antimycotics. The resistance proved to be a property of the mycelium as well as of the spores, which could be demonstrated by testing cultures grown from separated hyphae and cultures from isolated spores of resistant strains. The demonstration of this acquired resistance of fungi to several antimycotics was in accordance with similar qualities noted in strains of bacteria and also with experiences in the course of clinical treatment of fungus diseases. It was an indication to change an antimycotic treatment after some time.

2. Clinical investigations

Tinea capitis

Favus and Trichophytia capitis are nowadays much less frequent than they were 30 years ago. In the capital of one of the northern provinces (Groningen) during the years 1936—1945 a total of 334 cases of favus were seen. (HOHMAN & BRANDSMA, 1947). During this period there was a gradual retrogression and the second World War did not have an unfavourable influence. Also the incidence of trichophytia capitis diminished, while trichophytosis of the beard increased, especially during wartime.

An annular tinea of the right arm caused by *Trichophyton (faviforme) album* or *Grubyella alba* (OTA—LANGERON) is described by VRIJMAN (1950). This fungus, according to VRIJMAN, is rarely found to cause human infection, it had never been shown in the Netherlands in a similar instance and originated in this woman probably from black earth in a flowerpot, which she carried under her arm. In my opinion the statement of rarety of *Trichophyton faviforme (verrucosum) album* infections cannot be maintained when one does not consider the differences between the forms of *Trichophyton verrucosum* very important or takes these forms for synonymy.

Microsporia in man originates in Holland practically always from animal source, but it is rarely seen. SANDERINK & MALI (1956) saw two small epidemics due to *Microsporum felineum*, brought about by cats. Infections by human Microspora are seen occasionally as a result of importation from foreign countries.

Tinea pedis.

In 1946 VAN VOORST VADER published a thesis on swimmingpool infections. He confirmed the findings from elsewhere in Europe, that *Epidermophyton rubrum* was found in increasing number. Of 40 strains, grown from the feet, 4 proved to be *Epidermophyton rubrum*, 32 *Epidermophyton interdigitale*, 1 *Trichophyton sulfureum* and 0 *Epidermophyton floccosum*, while 3 could not be determined. Several times an *Epidermophyton* was cultured from entirely healthy skin. In two reformatory schools the children were examined for tinea pedis. Of 250 boys 32 showed a fungus infection; of 70 girls only 8. Prophylactic value of foot baths with NaOCl was traced by making one half of the boys take the baths under supervision during 7 weeks, while the other half served as controls. The bath proved to have an unmistakable detrimental influence on both number and gravity of the deviations of the skin and on the number of fungi found on the feet, too. For this reason, even when it should be possible to prevent contamination in the swimming pools in this way, this method must be rejected unconditionally.

In an article dedicated partly to epidermophytosis, partly to eczema by shoe lining, rubber, and such, SIMONS (1952) informs us that he found in Leiden on 44 cultures from the feet, 23 of *Trichophyton mentagrophytes*, 7 of *Trichophyton rubrum*, 12 of *Epidermophyton floccosum*, and 2 cultures of *Candida*. From this result the author draws the conclusion, that the mycological diagnosis Epidermophytosis corresponds in about 1/3 of the cases with the clinical and microscopical diagnosis. I should prefer to reserve the term epidermophytosis for the clinical diagnosis of a superficial mycotic infection of the skin as contrasted with the term trichophytosis for a mycosis of the hair. It is remarkable, that the number of *Epidermophyton floccosum* cultures is much higher than was found by other Dutch investigators. It is not evident, whether the author obtained his cultures only from the feet or also from other parts of the skin, for instance, the groins.

The increase of tinea pedis in the Hague is shown by BOTTGER (1954), who found on 352 cultures of dermatomycoses, 113 of *Trichophyton mentagrophytes*, 108 of *Trichophyton rubrum*, and no *Epidermophyton floccosum*. *Trichophyton Schönleini* (from favus capitis) was seen 6 times, *Candida albicans* 108 times, but it is not clear whether the last mentioned fungus was always the causative factor.

In Amsterdam epidermophytia was studied by CREMER (1953, 1954). During this investigation a chronic inflammation of the soles, caused by *Trichophyton rubrum* was seen many times, while 25 years ago the intertriginous and vesicular types of tinea pedis were exclusively met. In the vesicular type *Trichophyton interdigitale* PRIESTLEY, considered as a variant of *Trichophyton mentagrophytes* (ROBIN). BLANCHARD, could be usually cultivated. Among 104 cultures of tinea pedis, grown in the years 1951 and 1952, *Trichophyton rubrum* was found in 74 cases, *Trichophyton interdigitale* in 29 cases, and *Epidermophyton floccosum* only once.

Contamination of the hands from a preceding mycotic infection of the feet was, in the course of two years (1952—1953), seen in 70 patients out of 170 with tinea pedis. The infection of the hands was due to *Trichophyton rubrum* in all cases with one exception, in which a *Trichophyton mentagrophytes* was cultured. The lesions of the hands in the *rubrum* mycoses were sometimes very distinct, for instance marked hyperkeratosis, redness, chapping. But as a rule, they were not of a pronounced type, showing only slight scaling in concentric small areas and were easily overlooked. The infection of the skin of the fingers was mostly associated with onychomycosis, causing considerable trouble for the patient. A complete removal of the diseased nail, preceded by treatment of the skin, and a careful follow-up was considered as the best treatment for the onychomycosis.

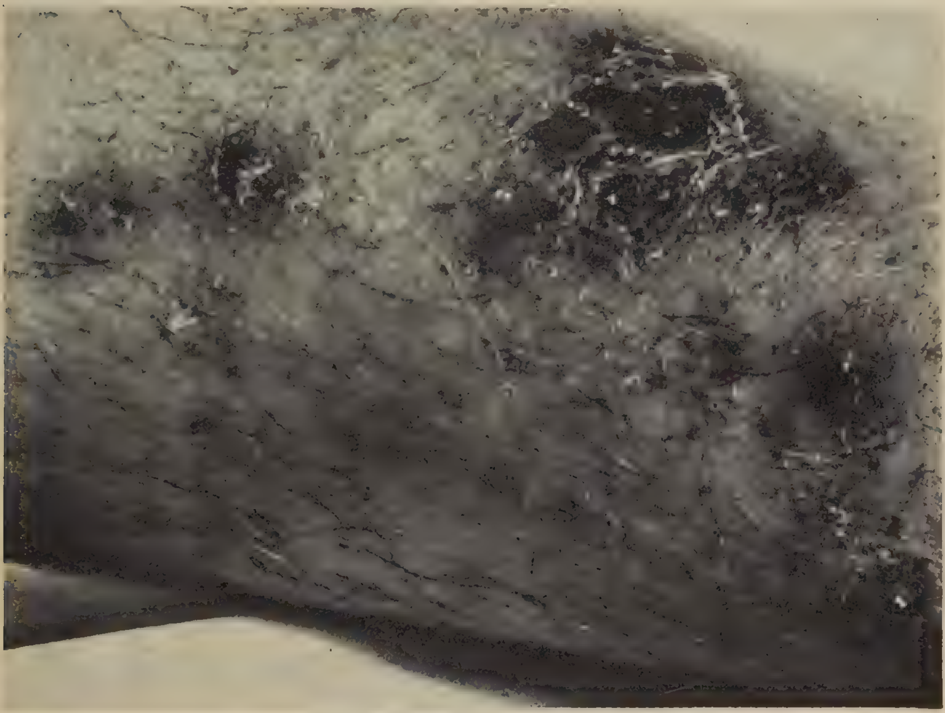


Fig. 2a. Granulomatous form of mycosis on the lower legs. (From: G. CREMER, A special granulomatous form of mycosis on the lower legs, caused by Trichophyton rubrum Castellani. Ned. Tijdschr. geneesk. **97,** 1463—1468, fig. 1 (1953)).

The increase of *T. rubrum* infections in Amsterdam had also become evident by another, then until unknown, complication.

Cremer (1953) described for the first time a series of 14 follicular, perifollicular and granulomatous fungus diseases of the lower legs due to *Trichophyton rubrum* (Fig. 2 a-b) and associated with tinea pedis. A single case of a similar infection attributed to a trauma as a consequence of dancing had been demonstrated the previous year by Wilson (1952). In 1954 this author, in co-operation with Plunkett and Gregersen, also published a survey of 14 cases. In both series only the lower legs of adult women were affected and only *Trichophyton rubrum* was found as the invader. Before that time the disease was often mistaken for an erythema nodosum, erythema Bazin etc. The fungus could be demonstrated deep in the granulomatous tissue by culture and in histologic praeparations coloured according the Hotchkiss-MacManus technic (Fig. 3, a-b). In the depth of the praeparation the follicular pattern was difficult to recognize.

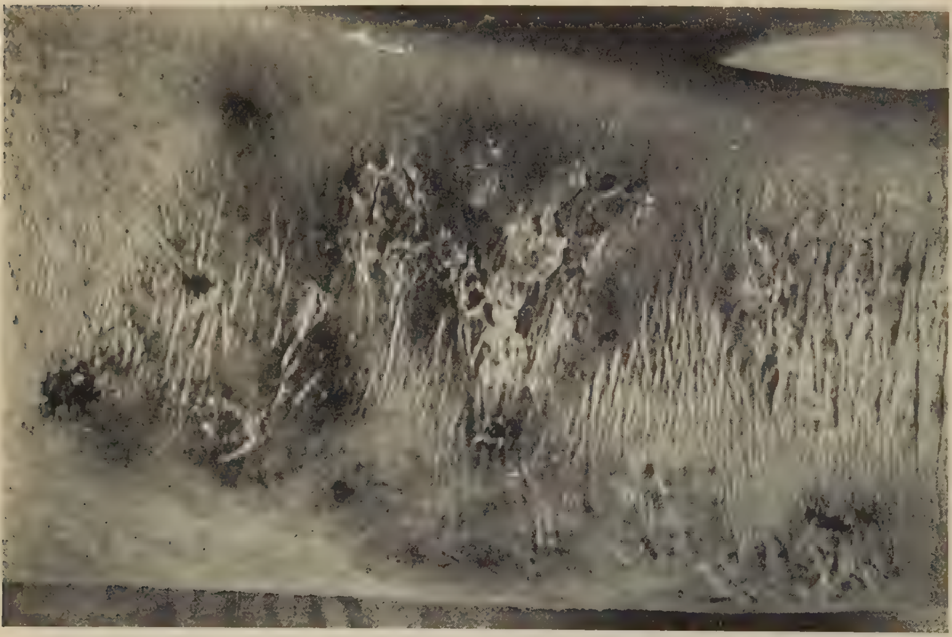


Fig. 2b. Granulomatous form of mycosis on the lower legs.
(From: G. Cremer, Ned. Tijdschr. Geneesk. **97,** 1463—1468, fig. 2 (1953)).

In the inflamed area of the legs mycelia were found in the scales and also in the hairs. The picture of the fungus with regard to the hairs was sometimes that of an ectothrix, sometimes of a typical endothrix. In our series, a pure endothrix was seen 5 times, an endo-ectothrix infection 4 times, and an ectothrix twice. In the first three cases the hairs were not examined for fungi.

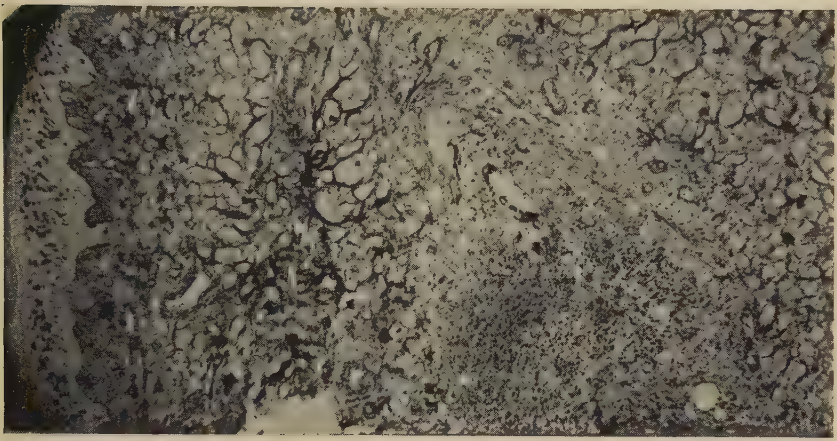


Fig. 3a. Section of granuloma, showing fungi deep in the tissue. (From: G. CREMER, Ned. Tijdschr. Geneesk. **97,** 1463—1468, fig. 6 (1953)).

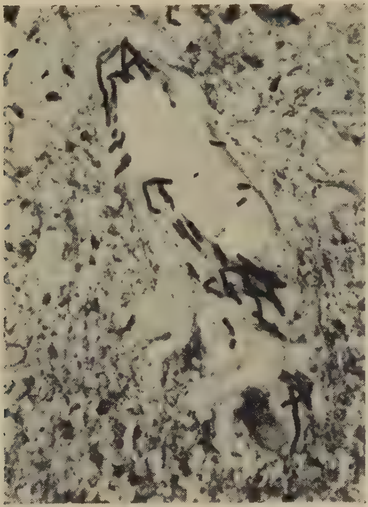


Fig. 3b. Higher magnification of fungi in Fig. 3a.
From: G. CREMER, Ned. Tijdschr. Geneesk. **97,** 1463—1468, fig. 5 (1953)).

Contrary to WILSON I not only saw the condition in darkhaired women but also in blond ones and most of them were certainly not in the habit of shaving their legs. The bald infiltrated plaques, in which the hairs were broken-off, were often surrounded by a normal hairy skin. Furthermore, I also noted the condition in one male patient with hyperkeratosis on the knee. For this reason, shaving does not seem to me an important factor in the explanation of these follicular infections. There was, however, a symptom, that could be established in all our patients, namely, a certain state of perniosis and keratosis follicularis of the legs. Keratosis was also present in the male patient. *Trichophyton rubrum* demonstrates a distinct preference for thick corneal layers in the chronic form of tinea pedis and tinea manuum. Therefore, the follicular keratosis, perhaps influenced by hormon factors, presents an acceptable explanation for the follicular localization on the lower legs.

That tinea trichophytica capitis does not always heal at puberty and also can be contracted after this time is mentioned by CREMER (1955 [1]) and illustrated by some cases. Four of these cases had developed or were aggravated simultaneously with Cushing's syndrom. The cases associated with Morbus Cushing are also discussed in an English paper by the same author (1955 [2]).

During this investigation it became evident, that the syndrom of Cushing, as caused by a hypernephroma or by prolonged treatment with ACTH and Cortisone, considerably lowered the defence of the skin and mucous membranes against a mycotic infection. In one of these patients, a 27-years old man, a *mentagrophytes* infection gradually spread from the feet over the whole body surface and even profusely on the scalp; hairs of scalp and pubis proved to be invaded. In a 65 years old woman a long standing slight infection of the scalp due to *Trichophyton tonsurans* spread on the whole scalp and the skin of the trunk and extremities.

The low body resistance was also obvious from the poor inflammatory reaction of the great ringworm patches as well as from the negative trichophytin tests. Antimycotic therapeutics were of little use, only reduction of corticosteroids or an extirpation of the suprarenals led to a distinct improvement.

TIO BIAUW SING (1950) completed his investigations with fatty acids by examining the therapeutic result of Curamycon in 83 patients as compared with 15 patients treated with a 5 % Whitfield ointment. Results with Curamycon were satisfactory, there was less irritation as compared with Whitfield ointment. Cultures, made from the 83 patients, grew only in 21 of them and only yielded *Trichophyton mentagrophytes*. Therefore TIO's therapeutic result does not wholly convince me, since no resistant *rubrum* mycoses were treated.

Treatment of onychomycosis is discussed in several publications.

STIGTER (1948) argued for his method existing in cutting away and abrasion of the affected nail in several sessions, combined with antimycotic treatment. He mainly gives his impression, but no exact figures.

Doornink (1952) considers removing the nail, followed by daily use of a fraise by a competent chiropodist as the treatment of choice. He further describes spontaneous cure in two cases of onychomycosis in the course of one to three years. The skin in these cases showed no symptoms; unfortunately no cultures were obtained.

Siemens (1954 a, b.) stated that a continued removal af the nail by an experienced nurse should be the best treatment for onychomycosis. He also demonstrated three adult persons with onychomycosis trichophytica of 6—12 years duration. They were cured by daily removing of the returning nails and nail beds with knife and nippers after extraction of the nail.

Zoon (1954) was very satisfied with a surgical treatment of onychomycosis, consisting in excision of nail plate, -bed and -matrix, a difficult operation which can only be practised for toe nails.

Prakken (1954) considered this method a too radical one for this little disturbing affection, as it requires many weeks of hospitalization and an operation of sometimes hours duration under narcosis.

Candidiasis.

On the subject of candidiasis Yo Bwan Hie (1954) elaborated a thesis (150 pages) on mycotic vulvovaginitis in pregnancy, a mycological and clinical study with an extensive summary in English. He pointed out, that for a sound taxonomic knowledge of the yeasts reference should be made to the basic studies of Dutch mycologists of the Baarn school (Berkhout, Diddens, Lodder, Kreger van ry).

Yo made a thorough study of the determination of the genus *Candida*, especially of the species *Candida albicans*, of the technic of yeast examination, the incidence of the fungi on different parts of the body and other subjects. After reviewing the literature of vulvovaginitis mycotica its predisposing factors were discussed.

The original investigations of Yo revealed, that in 300 pregnant women by culture test *Candida* was found 85 times in the fluor (28,3 %), namely *Candida albicans* 56, *Candida stellatoidea* 15, *Candida krusei* 4 and *Candida tropicalis* 7 times, while *Candida parapsilosis* was found once (two cultures were not further identified). Fresh and Gram preparations easily gave rise to erroneous diagnoses.

Only 38 pregnant women had serious complaints and distinct clinical symptoms of vulvovaginitis mycotica. These signs were due to *Candida albicans* in 37 of the patients, in one patient due to *Candida stellatoidea*. These two *Candida* species were encountered 6 and 3 times, respectively, in pregnant women without clinical symptoms, which proves their saprophytic existence on the mucous membranes.

There was, furthermore, a distinct relation in the *Candida* infection between its clinical significance and the number of the *Candida* colonies on Sabouraud-agar. In 6 *Candida albicans* infections without symptoms, less than 50 colonies were counted, while of the remaining 50 *Candida albicans* infections, 41 yielded by estimation more than 100 colonies.

Of the 15 infections due to *Candida stellatoidea*, in 12 cases more than 50 colonies were found, only one of these patients showed a distinct vulvovaginitis, while 10 had only slight symptoms and one had neither complaints nor symptoms. This might be an indication, that *Candida stellatoidea* possesses less pathogenity than *Candida albicans*.

The other *Candida* species only sometimes gave rise to few complaints and slight symptoms.

The duration of pregnancy had no significant influence on the number of positive cultures. So called "aciduric flora" was considered as a favourable factor for the infection with *Candida*. There was also a distinct correlation between a certain pH-range and the possibility of a positive culture.

In 40 pregnant women Yo compared cultures from the throat and faeces with cultures from the vagina. It appeared, that the throat and faeces were constantly negative in 25 cases, 23 of which were also negative as for the vagina. In the two positive cases from the vagina *Candida stellatoidea* was cultured. A positive culture from the throat and (or) the rectum was obtained in 15 women, 13 of which had a positive culture for *Candida albicans* from the vagina too. Four weeks post partum *Candida* could not be cultivated any more from the vagina in these 40 women.

De Bruïne & Rodenburg (1954) saw excessive monilial fluor after vaginal treatment with aureomycin.

Orie (1946) published a thesis on the presence and the significance of yeasts in the deeper air passages and concluded, that sofar not much had been established with certainty. This conclusion is based on a profound critical analysis of the literature on this difficult subject. Orie discussed the mycologic classification and experimental facts, the technics of yeast-examination from the sputum, the occurrence of yeasts in nature, in patients and healthy people, the pathogenicity for animals, the clinical symptoms especially in the generalized cases with or without affection of the lungs and the disease of Gilchrist and Stokes.

Orie's own research encompasses the goal, technic and results of examination of the different body fluids and an extensive investigation of 14 cases. He emphasizes the necessity of washing the sputum. The results of culture should correlate with the direct microscopical examination of sputum, particularly for the yeasts that grow easily.

Of 11 patients in which yeasts could be demonstrated, only in one was the presence of yeasts in the deeper air passages during the course of the disease proved. This case supported the idea of secondary thrush. In two later cases the presence of yeasts was definite in one and very likely in the other.

P. J. v. d. Werff (1951) described two patients with local chronic lung affections, whose condition deteriorated rapidly owing to fungus infections. Treatment with potassium iodide, creosote and especially neosalvarsan injections yielded very good results.

Deep mycoses.

Kooreman (1948) stated favourable results with immunotherapy in four patients with actinomycosis of the abdomen and neck. At first the patients were brought in an allergic state with injections of a gold compound (solganal B). After this the vaccin was injected.

Pannekoek (1954) described a fatal case of primary actinomycosis of the liver, with secundary infection by *Escherichia coli communis*. A subphrenic abscess and exsudative pleurisy developed in the course of the disease. *Actinomyces* as well as *B. coli* and *M. tuberculosis* were cultured from the pleural fluid.

Vrijman (1954) saw a deep mycosis of the feet in a girl of seven years, due to *Verticillium cinnabarium*, a saprophyte growing on rotten potatoes. The child, when in Indonesia, often played barefooted on a floor laden with potatoes. The strain grew in pure culture; intradermal and subdermal reactions with a vaccine of this fungus were strongly positive. Cure was obtained after prolonged vaccination and local application of antimycotic ointment.

C. v. Staveren (1956) reported the first case of coccidioidomycosis in the Netherlands. It was discovered by a routine examination, as a little round shadow in the left lung and diagnosed microscopically after operation. The patient, who was probably infected in the U. S. A., had a quick recovery and was later free of symptoms.

A case of histoplasmosis was published by Lindeboom, Hoogendijk & Hoogendijk-van Dort (1956). It was the first one in Dutch literature. The disease was acquired during a long stay of the patient in Java, but later recognized in Holland, after a biopsy of a granuloma under the tongue. Histological and cultural investigation showed typical *Histoplasma capsulatum*. The disease ran a fatal course through cachexia in spite of several therapeutic efforts.

The following year Cremer (1957) gave a description of an African case of localized cutaneous histoplasmosis, in which histologically so called Duboisi forms were found, while culture resulted in typical *Histoplasma capsulatum*.

3. General articles

In Planta Medica Westerdijk & de Vries (1954) gave a general review of the activities in the "Centraal Bureau voor Schimmelcultures" ("Central Institute for Fungus Cultures") at Baarn (Holland) for medical mycology. This Institute has the oldest and greatest collection of fungus cultures. It was set up in 1905 and includes nowadays 8000 strains. Since 1952, the Institute has established a special department for Medical Mycology, where materials for investigation can be handed in. The article briefly summarizes some points in the present state of knowledge in the medical mycologic field.

It has become a rule for medical and other investigators of fungus diseases in Holland to have their special mycologic findings tested or confirmed in this Institute.

Bibliography

Bottger, C. W. (1954) Onderzoekingen bij dermato- en onychomycosen. (Investigations on dermato- and onychomycoses). Nederl. Tijdschr. Geneesk. **98, 3347—3349.**

Bruïne, Tj. L. A. de & Rodenburg, A. C. J. (1954) Heftige monilia fluor na vaginale behandeling met aureomycine. (Excessive monilial fluor after vaginal treatment with aureomycin). Ned. Tijdschr. Geneesk. **98,** 924—925.

Cremer, G. (1953) A special granulomatous form of mycosis on the lower legs, caused by Trichophyton rubrum Castellani. Dermatologica **107,** 28—37; also Ned. Tijdschr. Geneesk. (1953) **97,** 1463—1469.

Cremer, G. (1954) Schimmelaandoeningen van de voeten. (Tinea pedis). Ned. Tijdschr. Geneesk. **98,** 2596—2606.

Cremer, G. (1955) 1 Trichophytie en Microsporie van het behaarde hoofd bij volwassenen; de invloed van ACTH en Cortisone op dermatomycosen. (Trichophytia and Microsporia of the scalp in adult; the influence of ACTH and Cortison in dermatomycoses). Ned. Tijdschr. Geneesk. **99,** 3044—3051.

Cremer, G. (1955) 2 The influence of adrenocortical hormones on dermatomycoses. Especially in the Cushing syndrom. Dermatologica **111,** 285—293.

Cremer, G. (1957) Histoplasmose, in het bijzonder de gelocaliseerde vorm. (Histoplasmosis, especially the localized form). Ned. Tijdschr. Geneesk. **101,** 1540—1545.

Doornink, F. J. (1953) Spontane genezing van onychomycosis; enige opmerkingen over de behandeling. (Spontaneous cure of onychomycosis; some remarks about the treatment). Ned. Tijdschr. Geneesk. **97,** 2925—2927.

Hohman, W. J. & Brandsma, C. H. (1947) Het voorkomen van favus en trichophytie gedurende de laatste 10 jaren. (The incidence of favus and trichophytosis during the last 10 years). Ned. Tijdschr. Geneesk. **91,** 10—13.

Kooreman, P. J. (1948) De immunotherapie bij actinomycose. (Vaccine-treatment in actinomycosis). Ned. Tijdschr. Geneesk. **92,** 446—452.

Lindeboom, G. A., Hoogendijk, J. L. & Hoogendijk-v. Dort, Tj. E. (1946) Histoplasmose. (Histoplasmosis). Ned. Tijdschr. Geneesk. **100,** 1227—1233.

Orie, N. G. M. (1946) De aanwezigheid en de betekenis van gisten in de luchtwegen. (The presence and the significance of yeasts in the deeper air passages). Thesis, Utrecht.

Pannekoek, J. H. (1954) Actinomycose van de lever; Colisepsis. (Actinomycosis of the liver; Colisepsis). Ned. Tijdschr. Geneesk. **98,** 1754–1761.

Prakken, J. R. (1954) Discussion. Ned. Tijdschr. Geneesk. **98,** 3349.

Sanderink, J. T. H. & Mali, J. W. H. (1956) Enige waarnemingen aangaande de epidemiologie van animale microsporie bij de mens, met katten als bron van infectie. (Some epidemiologic observations in man on animal microsporia, due to cats). Ned. Tijdschr. Geneesk. **100,** 3692—3697.

SIEMENS, W. (1954) Discussion. Ned. Tijdschr. Geneesk. **98,** 3349.

SIEMENS, W. (1954) Trichophytia unguium, genezen door langdurige dagelijkse exunguatie. (Trichophytia unguium, cured by prolonged daily removal of the nail). Ned. Tijdschr. Geneesk. **98,** 1657.

SIMONS, R. D. G. PH. (1952) Resultaten van een onderzoek naar "Epidermophytie" en eczeem door schoenvoering, alsmede van eczeem door rubber, leer, plastic en metalen onderdelen. (Results of an investigation on "Epidermophytosis" and eczema due to shoe lining, rubber, leather, plastic and metal accessories). Ned. Tijdschr. Geneesk. **96,** 2182—2188.

STAVEREN, C. VAN, (1956) Een geval van coccidioidomycosis. (A case of coccidioidomycosis). Ned. Tijdschr. Geneesk. **100,** 706—708.

STIGTER, W. (1948) Voorkomen en behandeling van onychomycosis. (Incidence and treatment of onychomycosis). Ned. Tijdschr. Geneesk. **92,** 4027—4031.

TIO BIAUW SING & VERHAGEN, B. A. (1949)[1]) Comparative investigations into the fungistatic action of fatty acids and other antimycotica in vitro. Dermatologica **99,** 139; also Ned. Tijdschr. Geneesk. (1949) **93,** 2241—2250.

TIO BIAUW SING (1949)[2]) Acquired resistance to fatty acids and sulfanilamide of certain Trichophyton strains. Dermatologica **99,** 231; also Ned. Tijdschr. Geneesk. (1949) **93,** 3136—3143.

TIO BIAUW SING (1950) Clinical observations on the treatment of dermatophytosis with fatty acids. Dermatologica **100,** 105; also Ned. Tijdschr. Geneesk. (1949) **93,** 3810—3814.

VOORST VADER, P. J. H. VAN (1946) Zwembadinfecties in het bijzonder de Epidermophytie en haar prophylaxis. (Swimmingpool infections, especially Epidermophytosis and its prophylaxis). Thesis, Utrecht.

VRIJMAN, L. H. (1954) Infectie door Verticillium cinnabarium (Corda) Reinke en Berth. (Infection by Verticillium cinnabarium (Corda) Reinke and Berth). Ned. Tijdschr. Geneesk. **98,** 1655.

VRIJMAN, L. H. (1950) Humane infectie door Trichophyton (faviforme) album. (Human infection by Trichophyton (faviforme) album. Ned. Tijdschr. Geneesk. **94,** 1878—1879.

WERFF, P. J. V. D. (1951) Longaandoeningen veroorzaakt door schimmels. (Pulmonal diseases due to fungi). Ned. Tijdschr. Geneesk. **95,** 1682—1690.

WESTERDIJK, J. & VRIES, G. A. DE (1954) Das "Centralbureau voor Schimmelcultures" in den Niederlanden im Dienste der medizinischen Mykologie. (The "Centraal Bureau voor Schimmelcultures" in the Netherlands, serving medical mycology. Planta Medica **3,** 86—93.

WILSON, J. W. (1952) Trichophytic granuloma (Tinea profunda) due to Trichophyton rubrum. Demonstration. Arch. Derm. Syph. **65,** 375—376.

WILSON, J. W., PLUNKETT, O. A., & Gregersen, A. (1954) Nodular granulomatous perifolliculitis of the legs caused by Trichophyton rubrum. Arch. Derm. Syph. **69,** 258—277.

YO BWAN HIE, (1954) Vulvovaginitis mycotica in de zwangerschap. (Mycotic vulvovaginitis in pregnancy). Thesis, Utrecht.

ZOON, J. J. (1954) Discussion. Ned. Tijdschr. Geneesk. **98,** 3349

SEMINAR ON HISTOPLASMOSIS

Report submitted by

JAN SCHWARZ

(5. IV. 1958)

On February 11, 1958 a seminar sponsored by the Jewish Hospital Association was held in Cincinnati, Ohio, at which 21 scientists participated.

Dr. C. W. EMMONS presented data about the morphology and biology of *Histoplasma capsulatum* and discussed briefly *H. duboisii*, which he is willing to accept as a new species. Dr. EMMONS emphasized the discrepancy between the frequent finding of *Cryptococcus neoformans* in pigeon manure and the paucity of reports on "epidemic cryptococcosis". He feels that several epidemics accepted as being caused by *Histoplasma* may actually have been cryptococcosis. He presented factual material about the house bat (*Eptesicus furcus*) being connected with the presence of *Histoplasma* infection in the cities.

Dr. M. L. FURCOLOW discussed epidemiologic data under three headings: 1. geographic limitation of the fungus *Histoplasma capsulatum*; 2. spread of the fungus in nature; 3. manifestation of infection in humans. He reviewed thoroughly the present theories in reference to the first and second points. Certain weeds recently have been found to have a similar distribution to *Histoplasma*. Wind, water, tornadoes possibly are instrumental in the spread of the organism. The frequent isolation of *Histoplasma capsulatum* from environments containing chicken manure was emphasized as was our ignorance of why this is true. Living on farms seems associated with higher sensitivity rates to histoplasmin than living in the city. This point was argued in the discussion by Dr. C. E. PALMER from experiences in Dalton, Georgia. Dr. FURCOLOW feels that the fungus grows in localized spots only and the infections could represent, in each case, an epidemic in miniature.

Dr. J. SCHWARZ presented a survey of his present thinking about the pathogenesis of the disease. The primary infection occurs most commonly by inhalation of spore containing dust and produces a primary complex in the lungs and satellite lymph nodes. At this time hematogenous spread occurs very commonly which even after many years is demonstrable in the form of calcified splenic lesions. This hematogenous spread occurs commonly in persons who have a subclinical "benign type" of primary infection, (which is the rule). The primary complex in histoplasmosis is generally larger than its counterpart in tuberculosis and it commonly becomes stippled with calcium. Such primary complexes were demonstrated in Cincinnati in 67% of 105 consecutive unselected autopsies. Complications in the form of bronchiectasis, broncholithiasis and perforation into the tracheobronchial tree are not uncommon secondary effects of the presence of enlarged lymph nodes of the primary complex. Histoplasmoma and cavitary histoplasmosis were mentioned and the question of reinfection raised and accepted.

Dr. J. J. PROCKNOW discussed the management of histoplasmosis and his experiences with treatment with amphotericin B. He is inclined to prescribe rest for a considerable time in symptomatic primary infections. The prognosis and symptomatology of cavitary histoplasmosis in his experience was less serious than in tuberculosis. While he finds the complement fixation titer diagnostically helpful, he does not feel that prognostic conclusions can be made with certainty from the level of the titer.

Dr. F. N. SILVERMAN presented in a systematic form the intra and extrathoracic x-ray appearance of histoplasmic lesions. He feels that the diagnosis histoplasmosis can be made by the radiologist only in selected cases such as in the widespread miliary calcifications in the lung, the concentric calcific lesions in the spleen, but he concedes that size of the primary lesions and the stippled character of the calcifications can be very suggestive of histoplasmosis. The disappearance of shadows after expectoration of broncholiths was demonstrated. Coin lesions with calcium are highly suggestive of a granulomatous etiology but this is not absolutely conclusive. Intracranial calcification does not seem to occur in histoplasmosis.

Dr. J. H. SEABURY presented data on treatment with promine, ascosin, and amphotericin B. With the latter regression of lesions and conversion of sputum to negative on culture was observed in a few cases. Dr. SEABURY explained his belief that animal experiments should be conducted in such a way that they do not merely represent "sensitivity studies in vivo" but actually reproduce clinical conditions by attempting to cure the disease after it has been given a chance to progress.

Dr. J. W. PEABODY, Jr. showed examples of his extensive surgical materials. His indications for surgery were refreshingly conservative especially in the cases of solitary calcified lesions in young persons. Surgical procedures may be necessary for establishing the diagnosis. Middlelobe syndromes, compressions of large veins (vena cava) and other intrathoracic complications were reported.

Dr. S. B. SALVIN discussed serologic and immunologic principles of histoplasmosis. The multiplicity of antigen fractions was mentioned. Resistance can be obtained in mice by sublethal inocculation with living organisms or by vaccination with fractions of the yeast cell wall. The ideal vaccine in Dr. SALVIN's opinion would provide protection against infection without producing positive skin sensitivity. Very instructive photographs of the cell wall taken through the electron microscope were demonstrated. Transfer of immunity was attempted in experimental animals.

Dr. N. F. CONANT summarized the results of the meeting in a masterful and graceful way. The discussion after each presentation was extremely lively and the participants enthusiastic.

LIBRI NOVI

E. Fejér — S. Szathmáry — D. Oláh — L. Szodoray — J. Uri: *Medizinische Mykologie.* (Hungarian). Verlag der Ungarischen Akademie der Wissenschaften, 1957. Budapest. (964 Seiten, 502 Abbildungen) Preis: 10 $, Kultura. Budapest. 62.

Das gewaltige Werk, das 964 Seiten umfasst, steht einzig da in seiner Art in der ungarischen Literatur und ist auch in internationaler Beziehung beachtenswert. Von ungarischen Forschern verfasst, die sich seit Jahrzehnten eingehend mit den Fragen der Mykologie befassen, gewährt es Einblick in deren weitverzweigte Gebiete, von den botanischen Beziehungen der Pilze bis zu den klinischen Krankheitsformen, vom Pathomechanismus der Mykosen bis zur Therapie. Das Werk soll demnächst auch in deutscher Sprache veröffentlicht werden.

Die allgemeinen und die detailmässigen *botanischen* Beziehungen werden auf 312 Seiten von S. Szathmáry behandelt, sodann folgt die klinische Mykologie auf 523 Seiten, der sich als abschliessender Teil die Schilderung der *Antibiotikenforschung* in Bezug auf die Dermatophyten anschliesst. Vom medizinischen Gesichtspunkt mag der botanische Teil vielleicht überdimensioniert scheinen. In Anbetracht der mehrere Jahrzehnte umfassenden Wirksamkeit Szathmárys auf diesem Gebiet, erschien es jedoch begründet ihm zur Veröffentlichung seiner weitverzweigten Erfahrungen Gelegenheit zu bieten. Im speziellen mykologischen Teil wird die Orientierung wesentlich erleichtert durch das reichhaltige Bildermaterial, grösstenteils aus Originalabbildungen bestehend, mittels welchem Morphologie und Entwicklung der einzelnen Pilzarten entsprechend illustriert, und an mehreren Stellen die durch verschiedene Pilzarten verursachte Krankheitsbilder veranschaulicht werden. Der botanische Teil dürfte auch für Botaniker von Interesse sein.

Vom medizinischen Gesichtspunkt besitzen die *Dermatophyten* die grösste Bedeutung, bei deren Erforschung die Wirksamkeit des aus Ungarn stammenden D. Gruby von bahnbrechender Bedeutung war. Überaus richtig ist die Behauptung Szathmáry's, wonach „die Dermatophyten vom botanischen Gesichtspunkt eine besondere Stellung einnehmen". Der Verfasser schildert eingehend die in der Systematik der Dermatophyten vorgehenden Änderungen, obwohl die Frage der Systematik seiner Ansicht nach noch nicht als abgeschlossen und definitiv betrachtet werden kann. Szathmáry befasst sich überdies eingehend mit dem Ursprung der Dermatophyten, wobei er deren Ursprung aus dem Boden durch Angaben seiner Forschungen unterstützt.

Im Teil über *klinische Mykologie* wurden *Mykrosporie, Trichophytie, Favus, Epidermophytie inguinalis, Pityriasis versicolor, Erythrasma,* sowie die gemischten Pilzinfektionen und einige Krankheitsformen von geringerer Bedeutung durch den verstorbenen D. OLÁH behandelt, dessen posthumes Werk eine würdige Vertretung seiner mehrere Jahrzehnte umfassenden mykologischen Wirksamkeit darstellt. Der Verfasser legt grosses Gewicht auf eingehende Schilderung und Therapie der einzelnen Mykosen. Auch diese Abschnitte sind mit schönem und reichhaltigem Bildermaterial illustriert.

Im Abschnitt über klinische Mykologie werden die bereits überwiegend polyaetiologischen Krankheitsformen in separaten Kapiteln behandelt. Diese überaus wichtigen Krankheitsgruppen: die *Fuss-, Hand- und Nagelmykosen* hat E. FEJÉR geschrieben, der auf diesem Gebiet auf eine sehr lange Wirksamkeit zurückblickt und äusserst wertvolle Beobachtungen und Erfahrungen besitzt. Die eingehende Behandlung der pathologischen, klinischen und therapeutischen Beziehungen dieser Krankheitsgruppe schildert anschaulich deren starke Verbreitung und grosse praktische Bedeutung. Die diesbezüglichen Kapitel enthalten in überaus sorgfältiger Bearbeitung eigene Beobachtungen und Feststellungen, und sind mit zahlreichen vorzüglichen, grösstenteils Originalabbildungen illustriert. Ausser den eingehenden klinischen Beschreibungen legt FEJÉR grosses Gewicht auf die therapeutischen Beziehungen, unter denen sich seine eigenen Originalmethoden, wie z. B. die neuartige Behandlung der Paronychien, etc. befinden.

Das folgende äusserst gründlich und eingehend behandelte Kapitel umfasst die *mykotische Allergie*, d. h. die *Immunbiologie,* den *allergischen Pathomechanismus der Pilzkrankheiten.* Auch dieser Abschnitt wurde von E. FEJÉR verfasst, der in Ungarn der beachtenswerteste Forscher auf diesem Gebiete ist. In diesem auf Grund seiner weitgehenden literarischen Kenntnisse, sowie der wertvollen eigenen Experimente verfassten Kapitel veröffentlicht der Autor die neuesten immunbiologischen Beziehungen, die er kritisch bespricht, um in zahlreichen Fragen, z. B. in bezug auf das Verhältnis der Trichophytin- und Tuberkulinreaktionen, sowie auf den Zusammenhang zwischen Penicillin-Allergie und Pilzinfektionen etc. auf Grund eigener Untersuchungen Stellung zu nehmen.

Dem Abschnitt über allergischen Pathomechanismus schliesst sich die Darstellung der auf *Pilzsensibilisierung beruhenden Krankheitsbilder* organisch an: der Erscheinungen von *Mykidcharakter.* Dieser Abschnitt ist nicht nur deshalb bedeutend, weil er auch den Pathomechanismus überall eingehend beleuchtet, sondern auch deshalb, weil die Untersuchungen von FEJÉR neue Feststellungen enthalten, und die Aufmerksamkeit auf den mykotischen Ursprung auch neuer, bis dahin kaum gewürdigter Krankheitsbilder lenken, unter anderem auf das *Hautjucken mykotischen Ursprungs,* das anhand seiner Untersuchungen auch als einziges Symptom der

Pilzallergie auftreten kann, ferner auf *mykogene Neurodermitis* und *mykogene Ekzeme.* Der Verfasser betont ferner die Bedeutung der primären Hautherde der Pilzsensibilisierung, die er eingehend ausgearbeitet und systematisiert hat.

Die besondere Bedeutung dieser durch Br. BLOCH inaugurierten experimentellen Mykologie und der von der reaktiven Antwort des Organismus ausgehenden Abschnitte liegt darin, dass sie in den Pathomechanismus eines bedeutenden und wichtigen Teiles der mykotischen Prozesse Einblick gewähren und die Perspektive für weitere Forschungen eröffnen.

Die folgenden, von SZATHMÁRY verfassten Abschnitte behandeln mit tiefgehenden Kentnissen die durch *Sprosspilze* verursachten Erkrankungen, die *Aktinomykosen*, sowie seltenere Pilzerkrankungen. Sodann folgen die auf die einzelnen Organe lokalisierten Prozesse, die *Pneumomykosen,* unter denen seit der verbreiteten Verwendung der Antibiotika mit breitem Spektrum, hauptsächlich die durch Candida verursachten Pilzkrankheiten grosse klinische Bedeutung erlangt haben, ferner die *Oto-*, *Ophthalmo-* und *Harnwegmykosen.* Bemerkenswerte und praktisch bedeutende Ergänzungsabschnitte behandeln die klinische Mykologie, die *tropischen* Pilzkrankheiten, ferner die Pilzerkrankungen der *Tiere,* sowie die *Epidemiologie* der Pilzkrankheiten, die vom praktischen Standpunkt überaus wichtige *Prävention* der Pilzerkrankungen, und die Topographie der krankheitserregenden Pilze in Ungarn, sämtlich in der vorzüglichen Darstellung von OLÁH. Dazwischen ist ein Abschnitt über *Berufsmykosen* von LAJOS SZODORAY eingeschaltet.

Der abschliessende Teil des Buches wurde mit viel Sorgfalt und Fachkenntnis von J. URI verfasst und behandelt die *Antibiotikaforschung,* mit besonderer Berücksichtigung der *Dermatophyten.* Dieser Abschnitt befasst sich mit einem neuartigen Gebiet, da die Erforschung der Antibiotika gegen krankheitserregende Pilze bisher durch die Erforschung der Antibiotika gegen Bakterien relative in den Hintergrund gedrängt wurde. Der Verfasser, der auf diesem Gebiet bemerkenswerte Initiativen und Ergebnisse verrät, behandelt eingehend den gegenwärtigen Stand der Wissenschaft in dieser Frage.

Es sei hervorgehoben, dass dieses grosse Werk, in welchem Erfahrungen und Experimente der Verfasser aus mehreren Jahrzehnten festgelegt wurden, in einem klaren, leicht fasslichen Stil gehalten ist, mit reichhaltigem, grösstenteils aus Originalabbildungen bestehendem, von wenigen Ausnahmen abgesehen, durchaus entsprechendem und anschaulichem Bildermaterial ausgestattet, sowie mit sorgfältig ausgewählten Hinweisen auf die Fachliteratur versehen ist, welche den Fachleuten auch als Quellenarbeit dienen können.

E. RAJKA

BENEKE, E. S.: *Medical Mycology. Laboratory Manual.* Burgess Publishing Co. 426 South Sixth Street, Minneapolis 15, Minn. 1957. Paper, ring binder, 186 pages. Price $ 4.—

This manual is primarily intended for the use by laboratory technicians, microbiologists, and students in medical mycology courses as a guide in the study and laboratory diagnosis of pathogenic fungi in men and animals. The material has been arranged so that the student trained in bacteriological procedures, with little or no training in mycology is introduced to some of the essential characteristics of fungi and some of the common contaminants before handling any of the pathogenic fungi.

The whole material is scheduled for 29 two-hours laboratory periods in which the basic laboratory procedures, common contaminants, superficial mycoses, dermatomycoses and the systemic (deep) mycoses are dealt with. Every chapter has a well selected group of references. The common contaminants (22 figures) are illustrated by black and white photomicrographs which, in lithoprint, hardly do justice to the subject. The same holds true even more for the clinical pictures (dermatomycoses, figures 24—29). As illustrative material most attractive and most valuable for the student are the 13 color plates put at the disposal of the author by The Upjohn Co., showing characteristic structures of pathogenic fungi in tissue and culture. Two synoptic tables, one about the characteristics of dermatophytes, the other about those of deep seated mycoses, add greatly to the usefulness of this manual. Finally, sources of culture media, of type cultures and of visual aides are indicated. A useful glossary is also included. This manual can be warmly recommended as an outstanding teaching tool.

TIBOR BENEDEK

ASNIN, D. I. (1956): *Immunodiagnostika Aktinomicoza.* (Immunodiagnostic of Actinomycosis). (Russian). Medgiz. Moscow, 90 pp. 36 figs., price: 3 R. 35 kop.

After giving the history of the etiology of actinomycosis from FOERSTER to the later work of S. F. DMITRIEV, (to whom the book is dedicated), A. brings together everything in the literature pertaining to his subject including serodiagnostic. He discusses the skin-allergy reactions in rabbits (experiments by DMITRIEV & SUTEYEV, 1939) and subsequently describes the methods of preparing antigen material from certain strains of *Actinomycetes*; this actinolysate provokes a number of classes or degrees of intensity of reactions which A, classifies from zero to sharply positive (6 degrees) which are described according to the experience of the

A. during the last ten years. Statistical data on 450 cases of actinomycosis studied by him are provided. In the following chapter, the use of two antigens — an actinolysate and a polyvalent actinomycete vaccine—is described as the first step in all investigations, together with the clinical observations. The results illustrated in a number of tables appears convincing especially when compared with data supplied on over a dozen case histories. A. concludes that during the last 15 years a leading role has been played by Soviet scientists in the remarkable gains made in this field, although the diagnosis of actinomycosis is still difficult and often belated in early and clinically poorly known forms. The observations on immuno-biological reactions with actinolysate as antigen show sufficient specificity and a practical value if the skin-allergy reactions are used complementary to the diagnose of actinomycosis. Actinolysate does not lose its activity during more than a year, and the vaccine during more than two years. There is a possibility of using immuno-biological tests as a criterion of the progress of the curative process. Control observations showed the presence of 13 % unspecific skin reactions and 2 % unspecific serum reactions. Parts of the methods described by A. are also described in papers and books quoted by him (particularly V. E. Predstechenski, V. M. Borovski, L. T. Margolina, G. Y. Sinay & O. G. Birger, and G. O. Suteyev (Actinomycosis, Medgiz 1951). These are included in the general literature which gives a good idea on recent work in U.S.S.R. in this field, but seems somewhat incomplete as far as foreign literature is concerned. The illustrations are photos showing symptoms on patients and colonies of Actinomycetes in culture.

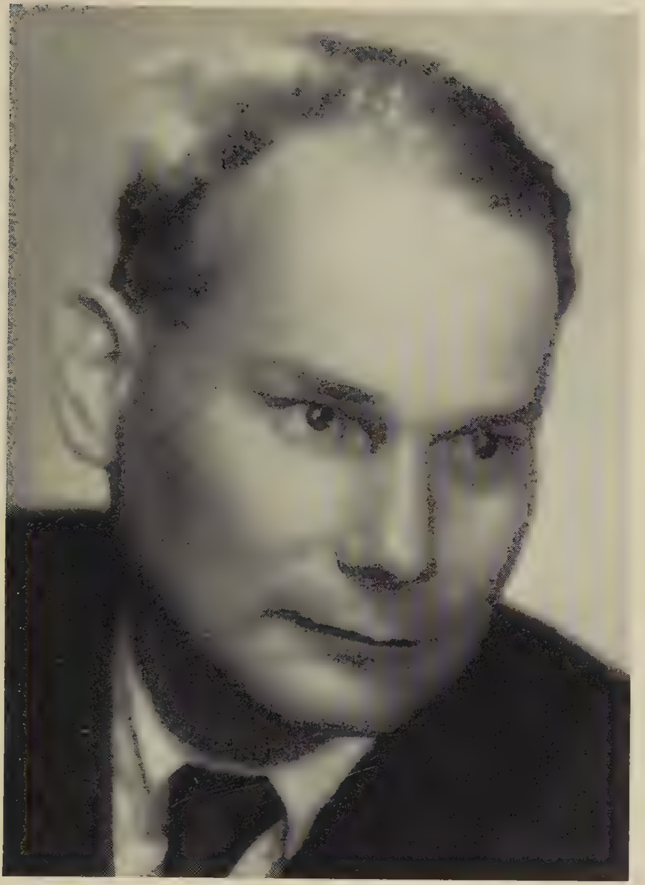
Rolf Singer

T. RAYSS

Department of Cryptogamic Botany, Hebrew University,
Jerusalem, Israel

Gallery of Contemporary Noted Mycologists

21



ALBERT PILÁT
Director, Department of Botany, National Museum,
Praha, C.S.R.

Gallery of Contemporary Noted Mycologists
22

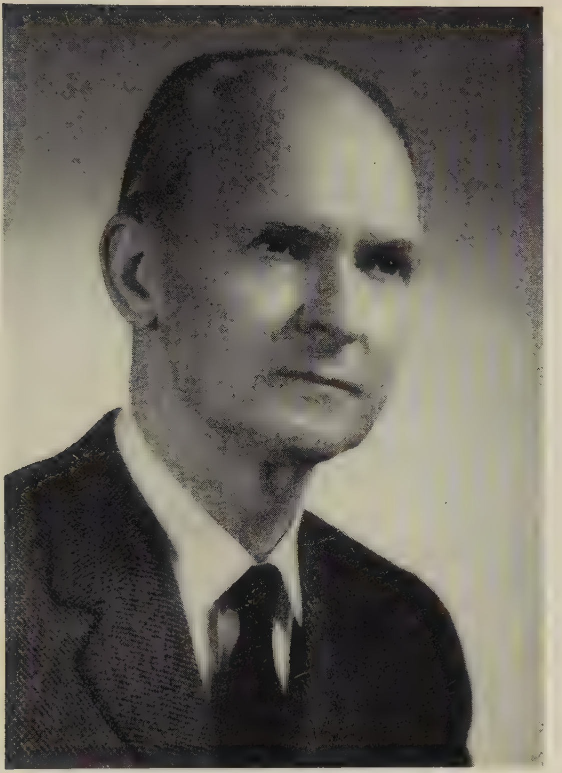


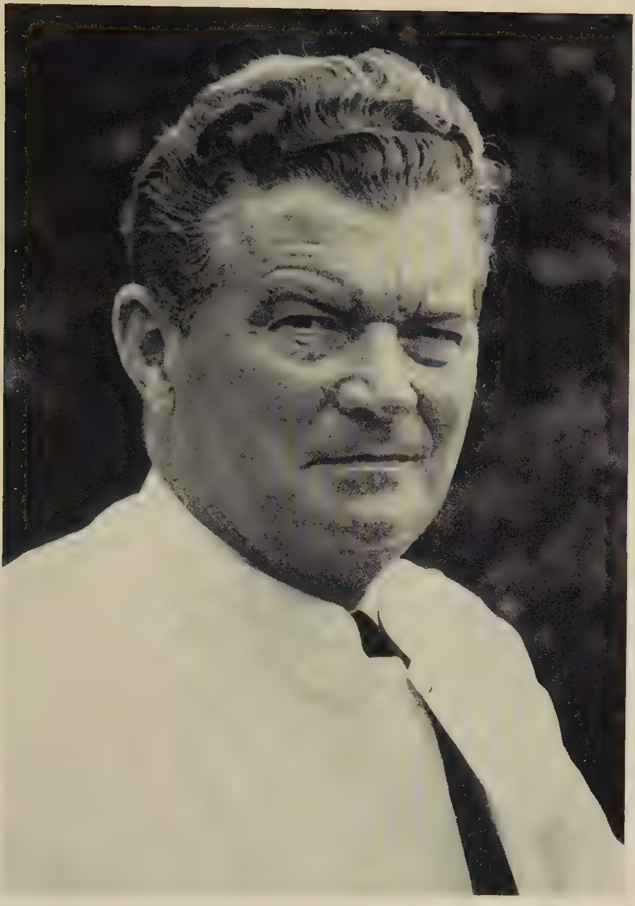
Photo Lavergne

O. N. COUCH

Department of Botany, University of North Carolina
Chapel Hill, N.C., U.S.A.

Gallery of Contemporary Noted Mycologists

23



J. ØRSKOV

Statens Seruminstitut, København, Denmark

Gallery of Contemporary Noted Mycologists

24

OBSERVATIONS ON AGARICS CAUSING CEREBRAL MYCETISMS

ROLF SINGER

(under collaboration of Dr. S. I. STEIN, and DR. RALPH W. AMES, and Dr. ALEXANDER H. SMITH)

(18.IV.1958)

Contents

Introduction, by R. SINGER, p. 261.
I. An unusual effect from a species of Mexican mushrooms, *Psilocybe cubensis*, by S. I. STEIN, p. 263.
II. The influence of temperature on mycelial growth of *Psilocybe*, *Panaeolus*, and *Copelandia*, by R. W. AMES, p. 268.
III. A *Russula* provoking hysteria in New Guinea, by ROLF SINGER, p. 275.
IV. About the identity of the "Weed Panaeolus" or "Poisonous Panaeolus", by R. SINGER & A. H. SMITH, p. 280.

INTRODUCTION

ROLF SINGER[1]

After some preliminary studies on the so-called hallucinogenic mushrooms from Mexico published partly by this author alone and partly in collaboration with Dr. A. H. SMITH (1958), there is still a large number of mycological, physiological, biochemical and clinical observations to be published and some to be finished in order to give a complete and general picture of the biological side of the problem of cerebral mycetism and to create a basis which will enable us to proceed further in a series of investigations — mainly chemical, pharmacological, and neuropsychiatric — which wait for more abundant and more diversified plant material. In addition to the better known and amply described cases of "hallucinatory" mushroom action in *Panaeolus* and *Psilocybe* as well as in *Amanita muscaria*, there is a case of somewhat comparable usage of mushrooms which also cause cerebral mycetism — at least this is the conclusion which one must draw reading the respective accounts — in parts of New Guinea. For the first time, specimens have been sent of these so-called "hysteria-producing" mushrooms and the results of their analysis will be submitted here.

---

[1]) Instituto Miguel Lillo, Universidad Nacional de Tucumán, Tucumán (Argentina)

The following four contributions are intended to throw some additional light on four aspects of the general problem of cerebral mycetisms. The respective questions have not been solved exhaustively, in any of the subjects, but I believe the observations are of some scientific and practical interest. In the case of Dr. STEIN'S contribution, it is particularly interesting to see that the Psilocybes do not lose their physiological activity on human experimenters after prolonged cultivation in laboratory and greenhouses and that at least some significant portion of the substances responsible for the mycetism is preserved after heating to frying temperatures. The practical importance of Dr. AMES'S contributions is self-evident, and will be followed up by nutrition studies on a wider scope. My own contribution puts mushroom hysteria where mushroom hallucinogens of Mexico had been by 1951, and much work would have to follow if this phenomenon were to be of similar attraction to applied scientists as were the Mexican Psilocybes. The note on *Panaeolus* is merely a small contribution toward the taxonomic problem of *Panaeolus* studies.

I wish to express my gratitude to Dr. LEON R. KNEEBONE, University Park, Pa., for his cooperation in the preparation of fruiting bodies of some of the significant agarics, particularly *Psilocybe cubensis* (plate 1), to Dr. ALFRED S. SUSSMAN for his continuous and most valuable help with advice in physiological problems and all kinds of courtesies, and to Dr. E. B. MAINS for his kind permission to use the University of Michigan Herbarium's facilities, as well as to Dr. K. L. JONES for his permission to use the facilities of the Department of Botany in the Natural Science Building for our purposes. Furthermore I wish to thank Dr. R. W. G. DENNIS of Kew Gardens Herbarium in England for the specimens turned over to me for study.

May I add that obviously all this work would have been impossible without the financial support given to us by the Bertram and Roberta Stein Neuropsychiatric Research Program Inc., Chicago, Ill.

I. AN UNUSUAL EFFECT FROM A SPECIES OF MEXICAN MUSHROOMS *PSILOCYBE CUBENSIS*

Sam I. Stein, M. D., Ph. D.[1]

The following notes are not a scientific report but merely a subjective description of the experience which I had with *Psilocybe cubensis* (Earle) Sing., collected and isolated in Mexico and subsequently cultivated (plate 1) from Dr. Singer's tissue cultures in a greenhouse, under the supervision of Dr. Leon R. Kneebone, Associate Professor in charge of mushroom research at Pennsylvania State University.

To determine the existence of significant effects in the carpophores obtained in greenhouses after several transfers of the original isolation, I followed the procedure described in the respective literature (Singer, 1958) on Mexican mushroom drugs. The method in brief is to eat the mushrooms raw, two at a time, until a psychoneurophysiological effect occurs. In October 1957 I had attempted this with *Psilocybe mexicana* Heim, collected and dried by Singer in Oaxaca, Mexico, in July of the same year, and sensed no subjective effects from two pair (four individual fruiting bodies) of this species. I had introduced one variation: I fried the mushrooms in butter since I was seeking to determine not only the effects in the Mexican species but if possible to compare such effects if any with those I had experienced in March 1949 when I had eaten what seemed to be nothing but the Commercial White Mushroom (*Agaricus bisporus* (Lange) Sing.).

On December 22, 1957 I decided to try the same procedure with a pair of the new crop of *Psilocybe cubensis*. Two well dried fruiting bodies weighing approximately 5 g fried in butter were eaten at 1.30 P.M. About 1.45 a yellowish halo developed around each object in the near field of vision. Shifting the eyes from an object of 2—3 feet distance to one of 5—6 feet distance gave clear vision for the latter. At 1.55 P.M. my memory was becoming impaired; the focus of attention could not be maintained, and some mild anger was expressed. At 2. PM. I was unable to concentrate on my work such as reading a letter and trying to recall its content. A sense of uneasiness developed. I was attempting to keep a record of events and to me it appeared as if the clock was standing still for I had listed three separate entries for the same period of time. At 2.05, a reddish hue replaced the yellowish halo to near objects. At 2.08, I took 4 drops (0.25 mg) of concentrated reserpine solution (Sandril) and there was a momentary suggestion of the experience disappearing. At 2.12 P.M., the experience was sensed even more extensively than before

---

[1] Coordinator of Research, The Bertram and Roberta Stein Neuropsychiatric Research Program, Inc., and Psychiatrist to the Chicago Alcoholic Treatment Center.

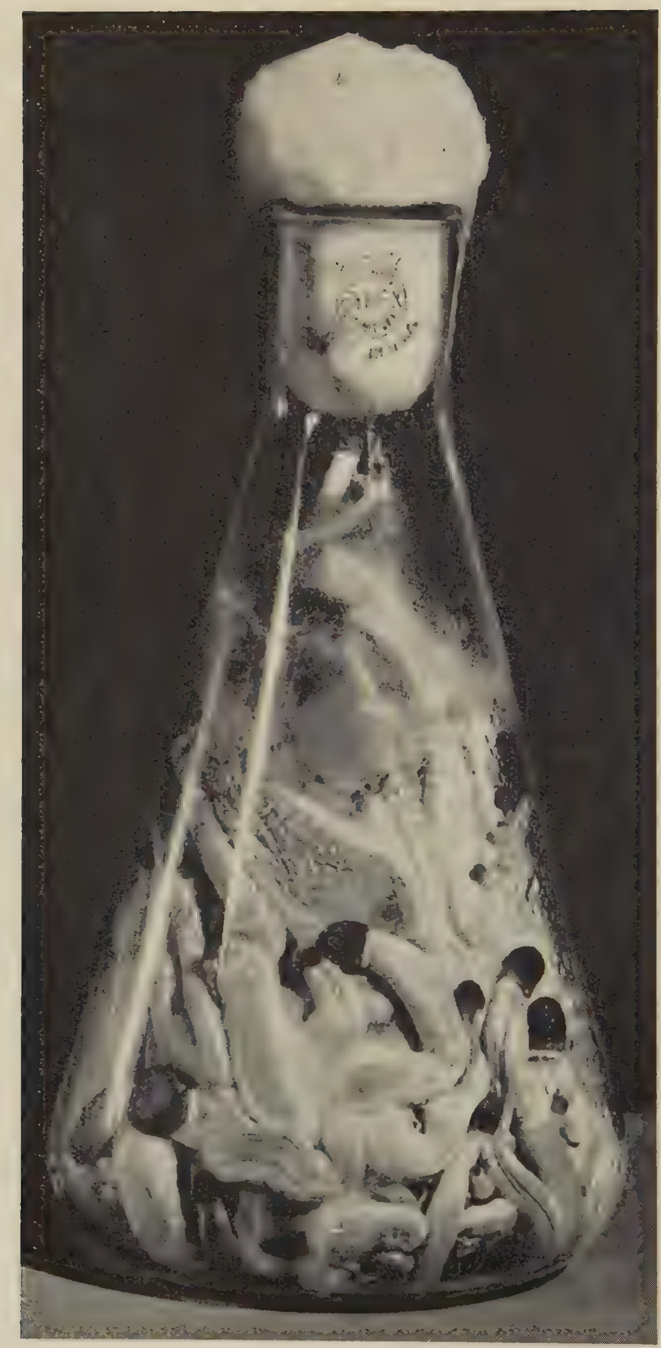


Plate I. *Psilocybe cubensis* (Earle) Sing. as grown in the laboratory, about ½ natural size.

and there was an intense desire to sleep. My pupils appeared moderately dilated. I moved around quite aimlessly to offset the sleep desire. With the cerebral disorganisation advancing, I decided to phone Dr. JESUS DE LA HUERGA [2]) so that he might observe me during this period. I was unable to remember his phone number but was able to find it in a directory of small print which I had to hold about a yard away to read. I informed Dr. HUERGA of the situation and indicated that I intended to drive to his house. A smothering feeling which had developed was somewhat dispelled as I went out of doors but all movement was slow. It was difficult to follow one line of thought since mentation was either concentrated on the distressful feeling within or shifted rapidly to any external stimulus. As I drove the three miles to his house a feeling of extreme weakness developed and the thought of needing a stimulant possessed me. While driving the colored halo disappeared and never returned. It was extremely difficult to concentrate on the correct route. Upon my arrival Dr. HUERGA examined my pupils and demonstrated to his wife their large size and the fact that eye convergence was lost. Sensory effect in my skin was so diminished that I was unable to take my own pulse rate or that of another. Only as Dr. HUERGA counted my pulse out loud was I aware of its rate. I asked for some liquor because of the profound weakness and discovered that even a sip merely increased the cerebral distress. Water had no effect and I drank two glasses. Since the intensity of the entire process was deepening I again tried 4 drops of reserpine but the condition remained unchanged. Dr. HUERGA suggested that I lie down but I felt too restless and too distressed "in the head". I called Dr. HUERGA's attention to Dr. SINGER's special delivery report on the progress of his work but again I could not concentrate sufficiently to gain the full information. As I read each line, I forgot the previous part almost immediately. Dr. HUERGA tried to discuss books pertaining to the biochemistry of the brain but I could attend to the topic only to the extent of making a copy of the name of the "Northwestern University Medical Library". I informed Dr. HUERGA that I did sense a control over the process in me but he suggested that I remain in his home. However, I decided to try and drive to my own house which is about a mile away, inasmuch as I felt as if I was smothering and wanted to be out-of-doors. During my visit with Dr. HUERGA it took my complete effort to present myself as one who was coherent, responsible, and in contact with his environment. There was less of an oppressive feeling as I reached the outside. Dr. HUERGA had checked my pupils again. As I drove along my mouth suddenly turned very dry as I had experienced once with an excessive dose of atropine. I could not recognize landmarks clearly and guided myself by watching for the names of streets. As I started on the last turn to my house, I felt trapped and I prayed. A tight feeling developed around my chest as if I would soon be unable to continue breathing. A sense of becoming overwhelmed by the process now developed and with this I fought to exercise even greater caution in my driving, thinking of the welfare of others in the event I were to lose consciousness. I had the car windows open.

---

[2]) Physician and biochemist, consultant to the B. & R. Stein Neuropsychiatric Research Program. He had been alerted the week before as to the probability of my running a test on this Sunday.

I reached the house without mishap. The feelings of smothering and losing consciousness were strong but I made my way into the house. Although the outdoor temperature was between 40° and 50°, I left the front door wide open. The further I went the more of a sinking feeling developed. I could not remember Dr. HUERGA's phone number. I took a sip of liquor but the condition was unchanged. I opened all the doors of the house and took one phone to the outside where I dialed the operator for information. I had the number repeated three times before I could retain it and I dialed it immediately. As I was telling Dr. HUERGA of my disorganiz edstatus, the family came in and it was decided that Dr. HUERGA would be kept informed and that I remain in the screened patio out-of-doors. I tried some coffee and even one sip brought only a different type of uncomfortable sensation. I started to suck ice chips. The feeling of "falling-apart" dominated the theme. I could barely concentrate long enough to complete a single tangible thought. There were rapid shifts of temperature sensations from feelings of being too hot to being too cold. At times the hair on my forearms were completely erect. There was intermittent spontaneous yawning and the desire to sleep. Again my mouth turned completely dry and one sip of coffee helped somewhat in this regard. I kept pacing for two full hours from 3 P.M. to 5 P.M. I asked Mrs Stein to keep talking to me which she did throughout this period and I attempted to maintain one trend of thought long enough to give an organized, coherent response. I kept complaining that I never felt more "horrible". Several phone calls required my attention and I tried to help in formulating a response but more often the caller was asked to leave a message.

About 5 P.M. there was a strong urge to urinate and I could barely get myself to enter the house long enough to complete this function. I noted the toilet bowl appeared so extremely small and so far away, I thought I would not be able to find the opening. About 5.30 the condition started to lift. My first normal or usual act was to take my son Joe in my arms and kiss him. I had Mrs Stein take my pulse since skin anesthesia was still present. The pulse rate was 80. The sphygmomanometer was fixed on my arm and I read my pressure to be 150/82 whereas usually it is about 130/65 (insurance M.D. 3 weeks ago). My temperature reading was 97.8°. Mrs Stein estimated the size of my pupils to be twice as large as those of Bruce, our 16 year old son. At this point, Bruce stated that as I walked my gait made him think of one who was unsteady or slightly inebriated. I urinated frequently and passed rather large volumes of clear fluid (no laboratory studies were made). I had not eaten since 9 A.M. but had no appetite for dinner. At 6 P.M. I sipped a glass of milk but ate no solid food until 10 P.M. There was a mild nausea early in the process but otherwise I experienced no unusual gastro-intestinal effects. At 9 P.M. I returned my telephone calls but my thinking was not fully effective.

Thereafter I called Dr. HUERGA and discussed the experience with him. I told him that the effects I had experienced with mescaline had been relatively negligible but that the effects from a standard dose of lysergic acid diethylamine only slightly resembled my experience with the mushrooms. However, with the LSD 25 I was in no way handicapped but in fact during its process and despite the colorful halo to objects I had been able to play a better than usual game of tennis. The LSD 25 experience I would want to repeat but never the one of this afternoon. In addition, this experience with *Psilocybe cubensis* in no way resembled my experience with *Agaricus bisporus*, presumed to have been mixed with fruiting bodies of *Panaeolus subbalteatus* (= *P. venenosus*), a process which had occurred in March 1949. In this latter case, there had been, initially, a most intensely painful diarrhea which lasted over 2—3 hours but which was followed by a very prolonged euphoric, stimulatory or excitatory period. The nature of this latter experience had led the author to investigate the psychoneuro-physiological effects of significant mushrooms.

There was a moderate "hangover" for about 24 hours consisting of some relative apathy and anergy, after *Psilocybe cubensis* had been consumed.

The experience with this species contains a warning for those who may want to follow a popular lead to allegedly pleasant effects which has been given in magazines and newspapers. The biochemical response of one individual may differ sufficiently so that a hazard may exist in using material of this species without its being standardized and without medical supervision.

Experiments will be continued but more judiciously, with properly systematized medical scientific process and observations as planned and available in the present research program.

Nevertheless, the present report may be of some interest as compared with previous reports by other authors. Furthermore, it proves to our own satisfaction the persistent physiological activity of an individual strand of Psilocybes even after numerous environmental changes, transfers and artificial fructification.

II. THE INFLUENCE OF TEMPERATURE OF MYCELIAL GROWTH OF PSILOCYBE, PANAEOLUS, AND COPELANDIA.

Ralph W. Ames [1]

Introduction

For obvious reasons it is of practical as well as theoretical interest to learn more about the effect of certain factors upon the growth of some of the "hallucinatory" fungi. This paper deals with the effect of temperature upon the rate of mycelial growth. Certain other factors which seem to influence the rate of growth in a 15° C incubator are studied in a preliminary manner.

The author wishes to express his appreciation to Dr. A. S. Sussman of the Botany Department, University of Michigan, for giving generously of his ideas and time during the conduct of this study, and to Dr. Rolf Singer of the Instituto Miguel Lillo, Tucumán, Argentina, for many helpful suggestions as well as for supplying the cultures which made this investigation possible.

Materials and Methods

Mycelial isolates of *Psilocybe cubensis* (Earle)Sing., *P. mexicana* Heim, and *P. caerulescens* Murr. were supplied by Dr. Rolf Singer from isolations he had made in the field while collecting. Growth tubes patterned after those described by Ryan, Beadle & Tatum (Amer. J. Bot. 30: 784—799, 1943) were used for measuring linear growth. The medium used for all studies was malt extract agar. Inoculations were made from two week old petri dish malt extract agar cultures. In this way it was possible to obtain all inoculum from the margin and thus have inoculum of essentially the same physiological age and condition.

Immediately following inoculation, the growth tubes were placed in the appropriate temperature chambers. Growth measurements were started after the mycelium had grown completely across the tube. Growth was measured daily at all temperatures except 9° and 15° C, where measurements were made at the end of a 9 day period. Cultures grown at 5, 9, 20, 25 and 27° C were maintained in large constant temperature rooms. Those grown at 28, 30, 32, 35 and 40° C were maintained in incubators in rooms at room temperature. Cultures grown a 15° C were grown in both a controlled temperature room and in a 15° C incubator in a 5° C constant temperature room.

In general, the cultures were grown in the dark except for the period of time when they were being measured or examined for growth.

All tests were run in replications of four.

---

[1]) Department of Botany, University of Michigan, Ann Arbor, Mich. (USA)

Mycelial Growth

The effect of temperature upon mycelial growth is shown in figure 1. The most abundant growth was obtained from *P. cubensis* which grew best at 30° C and was killed at 40° C. The optimum temperature for both *P. mexicana* and *P. caerulescens* was 27° C and both were killed at 35° C. None of the species produced any noticeable growth in a 3 week period at 5° C, but when removed to room temperature growth was resumed, thus indicating that the mycelium was still living.

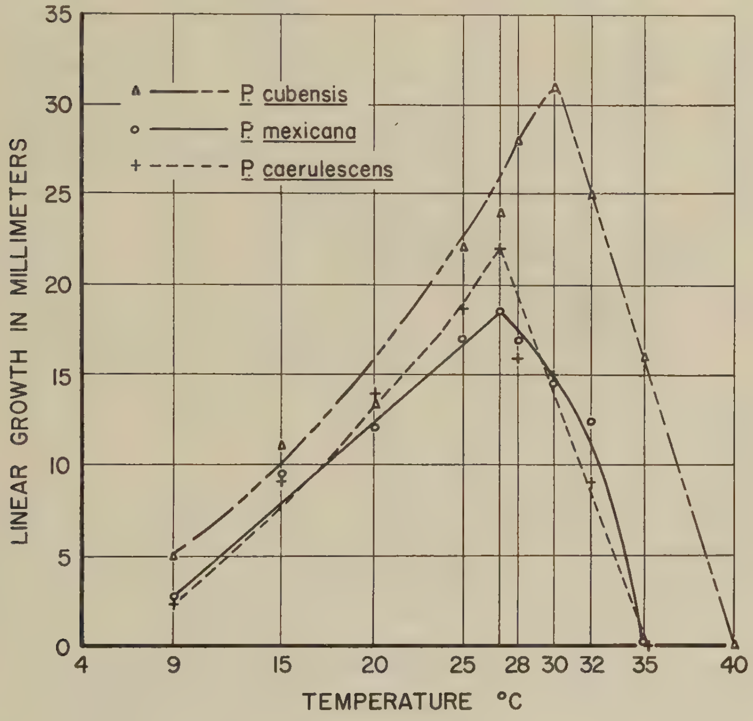


Fig. 1. Mycelial growth of *Psilocybe cubensis*, *mexicana*, and *caerulescens*.

At those temperatures where it was possible to make daily measurements of growth, all three species exhibited a relatively constant rate of growth. There was some deviation from a constant rate at 25° for *P. cubensis* (figure 2).

The various replications of all three species at all temperatures had essentially the same amount of growth at the end of a 9 day growing period. These results are shown in Table I.

As previously stated, the 15° C temperature was obtained in two different ways. The results obtained in the large constant temperature room were presented in figure 1 and seem to fit into what one

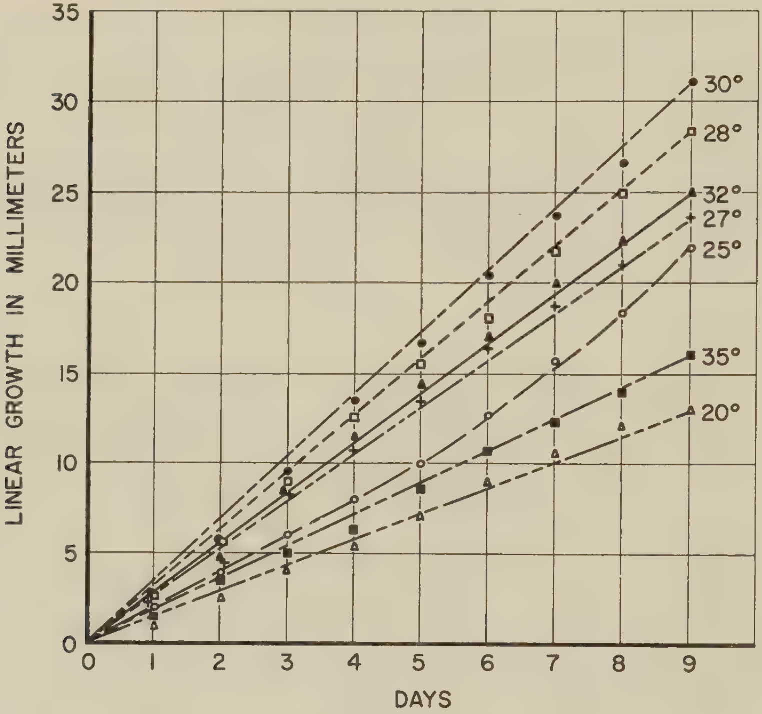


Fig. 2. Mycelial growth of *Psilocybe cubensis*

TABLE I.

Mycelial growth of Psilocybe at various temperatures (on malt extract agar in growth tubes)

Species	Replication	Linear growth in millimeters in a 9 day period at following ° C										
		5*	9*	15*	20*	25*	27*	28†	30†	32†	35†	40†
P. cubensis	1	—	5.0	10.0	10.0	23.0	22.5	28.0	34.0	27.0	17.0	—
,,	2	—	5.0	11.0	13.5	26.0	29.0	29.0	31.5	24.5	17.5	—
,,	3	—	4.0	13.0	14.5	17.5	—	28.5	27.0	24.5	15.0	—
,,	4	—	6.5	10.0	15.0	20.0	20.0	27.5	31.0	24.5	16.5	—
	ave.	—	5.1	11.0	13.3	21.9	23.8	28.2	31.1	25.1	16.2	—
P. mexicana	1	—	2.0	10.0	10.0	17.0	22.0	17.0	12.0	14.0	—	
,,	2	—	3.0	9.0	11.0	17.0	16.0	16.5	16.0	12.0	—	
,,	3	—	3.5	10.0	11.0	16.5	—	16.0	17.0	—	—	
,,	4	—	2.5	8.5	15.5	17.0	17.5	17.5	14.5	10.5	—	
	ave.	—	2.7	9.4	12.0	16.9	18.5	17.0	14.9	12.3	—	
P. caerulescens	1	—	—	8.5	13.5	20.0	22.0	16.5	16.0	9.0	—	
,,	2	—	2.0	9.5	14.5	19.5	22.0	15.5	13.5	8.5	—	
,,	3	—	3.0	8.5	14.0	18.0	21.5	15.5	16.0	9.5	—	
,,	4	—	2.5	10.0	—	19.0	23.0	16.0	15.2	—	—	
	ave.	—	2.5	9.1	14.0	18.9	22.1	15.9	15.2	9.0	—	

* Constant temperature rooms.

† Incubators in rooms at room temperature.

would think of as a normal growth curve. However, the results obtained from the 15° incubator were strikingly different. These results are shown in figure 3. Here *P. cubensis* had a total 9 day growth of 27.5 mm as compared with 11.0 mm in the room. *P. mexicana* grew 22.6 mm as compared with 6.5 mm in the room and *P. caerulescens* grew 20.5 mm as compared with 6.0 mm in the room.

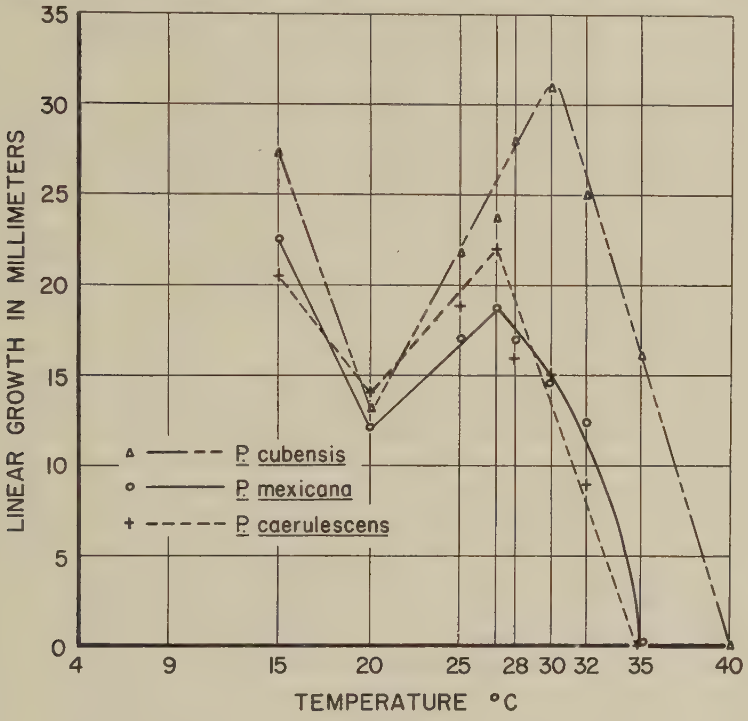


Fig. 3. Abnormal stimulative effect on mycelial growth of *Psilocybe cubensis, mexicana,* and *caerulescens* in 15° C incubator.

There seemed to be two readily acceptable explanations for this increased amount of growth. 1) Fluctuations in temperature (since these cultures were exposed to a 5° C temperature for about 5 minutes daily as the measurements were being made), or 2) Exposure to light as the cultures were being read. To explore these possibilities, the same cultures were returned to the incubator and the incubator left closed until 9 days had elapsed, at which time the cultures were removed and growth measurements taken. The amount of growth obtained, while not as great as that obtained during the first 9 day period, was still considerably greater than was obtained in the room. *P. cubensis* grew 22.0 mm during the second 9 day period (constant temperature and no light) as compared with 27.5 mm for the first 9 day period (5 minutes 5° C temperature and 5 minutes light daily) and 11.0 mm for 9 days in the room (constant temperature and 5 minutes light daily). Comparable growth for *P. mexicana* are as follows: 11.4, 22.6 and 6.5 mm and for *P. caerulescens* the growth was 8.9, 20.5, and 6.0 mm.

These results seemed to rule out large fluctuations of temperature or exposure to white light as the incitant of the increased growth. However, it was now necessary to investigate the possible effects of infra red radiation from the heating elements in the incubator and also the effects of minor temperature changes that might occur in the incubator.

In order to study these effects a larger incubator was moved into the 5° C room and adjusted to 15° C. Cultures were then placed in the incubator. One group was wrapped in aluminium foil (with the idea that infra red would be filtered out) and exposed to about 5 minutes of 5° C temperature daily. A second group was wrapped in foil but left in the incubator at the constant 15° C temperature. A third group was left unwrapped in the incubator at the constant 15° temperature. Growth measurements were taken at the end of 9, 18 and 27 days. The results are shown in Table II. In all cases the greatest amount of growth was obtained in tubes which were unwrapped and held at the constant 15° temperature; the next greatest growth was obtained in the wrapped tubes exposed to fluctuating temperature; the least growth was obtained on unwrapped tubes held at a constant 15° C. If growth in the unwrapped constant temperature treatment is taken as representing 100 %, then in *P. cubensis* the total growth in the wrapped fluctuating temperature tubes was 85½ % and in the wrapped constant temperature tubes was 74 %. Comparable growth for *P. mexicana* was 79 % and 65 % and for *P. caerulescens* 79 % and 71 %. However, the growth rates as indicated in ratios for the last 18 days of the experiment show the differences even more markedly. Following the same sequence of treatments outlined above, the mm growth per 18 day period were as follows: *P. cubensis* — 42.0: 36.5: 32.0; *P. mexicana* — 34.5: 28.5: 19.5; *P. caerulescens* — 35.0: 27.0: 25.5.

TABLE II.

Mycelial growth of Psilocybe in 15° C incubator in 5° C room (on malt extract agar in growth tubes)

species	Millimeters linear growth when treated as follows:								
	wrapped & constant temperature			unwrapped & constant temperature			wrapped & fluctuating temperature		
	9 days	18 days	27 days	9 days	18 days	27 days	9 days	18 days	27 days
P. cubensis	13.7	14.9	17.2	18.9	19.7	22.7	15.7	17.8	18.6
accumulative		28.6	45.8		38.6	61.3		33.5	52.1
P. mexicana	14.6	9.9	9.4	17.5	17.2	17.5	14.6	12.2	14.4
accumulative		24.5	33.9		34.7	52.2		28.8	43.2
P. caerulescens	11.4	11.1	14.5	16.9	17.0	18.2	14.1	14.0	13.2
accumulative		22.5	37.0		33.9	52.1		28.1	41.3

Cultures grown in the 15° C. room had been divided into three groups. 1) Unwrapped tubes at air temperature, 2) wrapped tubes at air temperature, and 3) unwrapped tubes in a large water bath at room temperature. Essentially the same growth was obtained in all treatments (Table III). Growth obtained in the unwrapped tubes at air temperature was used in defining the growth curve shown in figure 1.

Constant temperature recorders placed in the 15° C incubator and in the 15° C room indicated that there were no major fluctuations in temperature. The temperature in the incubator varied a little over one half degree and this variation was spread over a period of several hours, while the temperature in the room varied a little more than one degree and a little more abruptly. Readings taken from thermometers placed in wrapped and unwrapped tubes indicated that there was no difference in the two treatments in the constant temperature room and in the 15° C incubator the difference was minor, being from ½ to 1 degree higher in the wrapped than in the unwrapped tubes. The unwrapped tubes had the same internal temperature as the air surrounding them in the incubator. Thus it would seem that temperature fluctuation is not involved in the growth effect noted.

Studies are now underway to determine the cause of the unusual amount of growth which occurs in the 15° C incubator.

These species were also grown on Czapeks (1 % sucrose, 1½ % yeast, 1½ % malt) agar in the 15° room and it was found that *P. caerulescens* produced oidia in both wrapped and unwrapped tubes. These "oidia" would be called arthrospores by LANGERON and his school. This form of propagation is often observed in Agaricales. SINGER provided the following descriptive data: They are 2.8—3.7 × 1.5—2 μ in single cells, in paired cells e. gr. 5.3 × 2 μ, and as single elements in multicellular chains about 4.2 × 2 μ. They originate by septation of the hyphae of the secondary binucleate mycelium and the single or compound oidia separate by septation, especially of the aerial portion of the growth. All are hyaline, smooth, and thin-walled.

TABLE III.

Growth of Psilocybe in 15° C constant temperature room (on malt extract agar in growth tubes)

species	Millimeters linear growth with following treatment:					
	Immersed in water		Wrapped in foil		Unwrapped	
	9 days	18 days	9 days	18 days	9 days	18 days
P. cubensis	8.5	10.2	12.0	12.7	11.0	9.5
accumulative		18.7		24.9		20.5
P. mexicana	8.4	7.0	9.5	8.0	9.4	6.9
accumulative		15.4		17.5		16.3
P. caerulescens	9.0	11.6	8.8	9.2	9.1	9.2
accumulative		20.6		18.0		18.3

Dr. ROLF SINGER graciously supplied cultures of *Psilocybe candidipes* SING. & SMITH, *P. muliercula* SING. & SMITH, *P. aztecorum* HEIM, *Panaeolus subbalteatus* [3] (BERK. & BR.) SACC., and *Copelandia cyanescens* (BERK. & BR.) SING.

Preliminary studies were made upon the cultures of these species, with an endeavor of determining the effect of temperature upon mycelial growth. The same techniques were used as those previously described except that only five different temperatures were used. From these limited experiments, the approximate optimum temperature for the various species is (in ° C):

Psilocybe candidipes	27°
Psilocybe muliercula	23°
Psilocybe aztecorum	23° (or less)
Panaeolus subbalteatus	30°
Copelandia cyanescens	27°

Summary

Studies in growth tubes on malt extract agar indicate that *Psilocybe cubensis* grows best at 30° C and is killed at 40° C. Both *P. mexicana* and *P. caerulescens* have an optimum of 27° C and are killed at 35° C. None of the species made noticeable growth in a 3 week period at 5° C, but when they were removed to room temperature the cultures resumed growth thus indicating that the mycelium was still living.

Cultures grown at 15° C in an incubator showed a striking increase in mycelial growth as compared with growth at the same temperature in a constant temperature room. This increased growth does not appear to be caused by temperature fluctuation or exposure to white light. Studies now underway or planned will attempt to find an explanation for this phenomenon.

---

[3] This is the same as *Panaeolus venenosus* MURR., see details in the fourth communication of this article, by SINGER & SMITH.

III. A RUSSULA PROVOKING HYSTERIA IN NEW GUINEA.

ROLF SINGER

The existence of cerebral mycetisms has been shown as connected with several groups of larger fungi, particularly Agaricales, apparently mainly representatives of the section *Caerulescentes* in the genus *Psilocybe* as used in Mexico; a race of *Amanita muscaria* in Eastern Asia on and near Kamchatka; a number of species of *Panaeolus* (and perhaps closely related genera) in North America and perhaps Europe; and finally — the subject of the present communication — *Russula* in New Guinea.

According to A. L. GITLOW [4]), one of three inebriants in use among the Mount Hagen tribes, is a mushroom. It incites, according to GITLOW, "fits of frenzy and has even been known to result in death. It is taken before going out to kill an enemy, or in times of anger, sorrow or excitement". The name of the mushrooms was indicated as "nonda" by GITLOW.

More recent data have been obtained through correspondence with an Australian group of investigators — unfortunately none of them a mycologist — who refer to the phenomenon as the Wahgi River frenzies, and the mushrooms as "hysteria-producing". I do not wish to anticipate any anthropological or as the word reads "ethnomycological" data since others are undoubtedly much more competent to do so, and I shall limit myself to the mycological aspect of the material received, indirectly, from this group. May it suffice to say that the specimens came from Binj, Territory of Papua and New Guinea, and that the collector indicates as the vernacular name of Minj origin "nondorbingi" which clearly shows the relationship with the reported name "nonda", the same as "nondorbungor", the corresponding name used by the Banz people.

Russula nondorbingi SING. spec. nov. (Plate 2).

Pileo dilute griseo, pallidore marginem versus, viscido, glabro, convexo-subgloboso, dein applanato, semper leniter umbilicato, margine acuto, levi demum breviter sulcato, diametro pilei 56—72 mm. — Lamellis aut cremeis aut albis (in liquido praeservatis stramineis), aequalibus, simplicibus, confertissimis, demum confertis, attingentibus subliberisque ve ladnato-subdecurrentibus, mediocriter latis, anastomosantibus. — Stipite albido (stramineo in liquido praeservato), glabro, solido, aequali vel apicem versus attenuato, brunneo-maculato, evelato, mycelio basali sordide pallido. — Carne albida. — Sporis echinatis hyalinis vel flavidis, 10—13.5 × 8.7—12.7 μ, spinulis altis; cystidiis contentu granuloso vermiformique destitutis, numerosis, voluminosis; macrocystidiis in superficie stipitis pileique nullis; epicute pilei ex hyphis frequenter in formationibus cystidioideis, pluriseptatis terminantibus, in massa gelatinosa undulatis, tenuissimis hyalinis efformata; in tramate hymenophorali cellulis isodiametricis abundantibus; subhymenio e cellulis subglobosis minusculis constante. — Binj, Novae Guineae (Australia), Octobri mense, leg. S. H. Christian, holotypus in Herbario Universitatis Michiganesis conservatus est.

---

[4]) As quoted by WASSON, V. P. & G. R. RUSSIA, *Mushrooms and History*. 1957.

Pileus light gray, paler at margin, deeper colored in center, glabrous, with acute and smooth margin but eventually becoming short-sulcate, viscid, subglobose to convex, eventually convex to applanate, always slightly umbilicate, 56—72 mm. broad.

Lamellae cream colored (?) or possibly remaining white (pale stramineous in preserved material and whitish in dried material), equal, simple, crowded, later close, varying from attingent-subfree to adnato-subdecurrent but very narrowly attenuate at the apex of the stipe, 6.5—7.5 mm. broad (medium broad) where broadest, always distinctly anastomosing (near flesh). Color of spore print unknown.

Stipe white or whitish (light stramineous in preserving fluid), with small brown spots, glabrous, subrugulose, solid, then spongy-hollow, equal or tapering upward, 58—90 × 15—28 mm.; veil none; basal mycelium sordid-pallid. —

Context white or whitish, apparently rather firm in the pileus and becoming spongy in the stipe; odor and taste not recorded, but taste obviously not acrid.

Spores 10—13.5 × 8.7—12.7 μ, more often almost globose and yellowish in the largest spores than in smaller ones and more subglobose and hyaline in the medium sized and smaller spores, echinate with long (1.5—2 μ) isolated (ornamentation type VI) spinules.

Basidia 49—52 × 14—17.3 μ, in some carpophores also smaller mature basidia present but mostly large and broad, mostly 4-spored, some 2-spored; sterigmata 6—10 μ long, straight, spinulose ("gastroid"), others half-sickle-shaped, the latter type prevalent.

Cystidia 70—115 × 7.5—20 μ, cylindric to fusoid-ventricose or similarly shaped (like macrocystidia, but "empty"), without any banded or granular contents and without protoplasmatic opacity and not staining brown in sulfoformol, with rounded attenuate or acute apex, and either with or without an appendage (which is up to 7 × 1.5 μ), hyaline, with rather thick wall, not metachromatic in cresyl blue mounts, sometimes some incrusted, more numerous on edges than on sides but striking and numerous in both locations, often with a central secondary septum, projecting beyond the basidia, the septate cystidia much like primordial hyphae, with rounded ends, but in this form observed only on and near edges; aside from these cystidia there are also differentiated cheilocystidia which never occur away from the edge, resembling closely the terminal cells of the epicutis (see below), these as well as the other cystidia occurring on the edge slightly smaller on an average than those of the sides and those on the epicutis, edge cystidia intermixed with a few basidia, often ending in phantastically distorted tips and irregular appendages.

Hyphae: Subhymenium well developed, cellular; hymenopodium well developed, consisting of parallel hyphae running towards the edge, forming a rather thick layer; hymenophoral trama proper consisting mainly of spherocysts but with some filamentous hyphae intermixed; epicutis of pileus consisting of hyaline hyphae imbedded in a hyaline mucilaginous mass, loosely and irregularly arranged, wavy, very thin, smooth, simple, some ending in characteristic cystidioid terminal members, septate, mostly looking somewhat like primordial hyphae, mostly acute or subacute, rarely with rounded tips, rarely somewhat granularly incrusted, usually smooth, sometimes with a beak-like appendage (2 μ diameter), hyaline or some somewhat yellowish, thin-walled, the cells between the secondary septa varying considerably in diameter, 5—12 μ thick, 15—30 μ long, without contents, arranged in form of an ixotrichodermium, total length of cystidioid body (regardless of septa) 50—150 μ. Underneath the epicutis a nongelatinized cutis of filamentous (1—3.3 μ) hyphae — the hypodermium. Surface layer of stipe consisting mainly of filamentous hyphae, some ending in the same kind of cystidioid terminal members as those of the epicutis. Context composed of nests of spherocysts and some filamentous hyphae; oleiferous hyphae rare; laticiferous vessels none. All hyphae without clamp connections.

Obviously on earth in some type of tropical forest (no data available on the accompanying vegetation). Binj, New Guinea, formalin material collected by S. H. Christian, comm. R. W. G. Dennis (MICH, K). The formalin material preserved at MICH is the holotype.

This *Russula* is not actually close to any *Russula* we know, yet it is a typical representative of that genus and might be put in section *Elephantinae*. The long and isolated spinules on the spores, the content-less cystidia and the color of the pileus are characteristic.

It cannot be claimed that this *Russula* is the only species producing hysteria in that region. The original assembly of fungus fragments, containing also a *Russula*, contained on top of it some other agarics and at least one polypore. The most remarkable and outstanding specimen was an agaric, difficult to place under the circumstances, especially lacking better material and field notes, but in view of the interest such species have in folklore and possibly some day in applied fields of science, we shall describe it as well as possible:

Agaricales, spec.

Pileus blackish or blackened in part, brown in other parts, described as black but probably blackened during handling or drying, apparently glabrous, about 20 mm. broad. — Lamellae moderately broad or narrow, color of those of *Psilocybe*, close. — Stipe longer than diameter of pileus, now about 2 mm. thick.

Spores 10.5—12 × (5)—7.7—8 μ, similar to those of *Porphyrellus subflavidus* and *Boletellus betula, Ganoderma applanatum* and other *Ganoderma* species, *Setchelliogaster tenuipes, Tubaria thermophila, Metraria insignis* etc. since they have an ornamentation consisting of imbedded thin-cylindrical spinules, colored deeper than the imbedded exosporial and perisporial material, in this case deep purple brown or porphyrous-fuscous, perisporium hyaline, exo-, epi- and endosporium dull stramineousmelleous, apical modified (without ornamentation) and showing what is rather a callus than a germ pore, ellipsoid to ovoid-ellipsoid, or fusoid-ellipsoid, slightly inequilateral, more convex on outside than on inside, axially asymmetric, with attenuate but nearly obtuse apex, not truncate, without a suprahilar plage, applanation, or depression. Basidia not seen individually and entire; sterigmata four. Cystidia yellow and refringent, some thick-walled, numerous, lower half broadly ventricose upper half more or less cylindric and narrow (3—5.7 μ) or subcapitate (capitulum 4—6.5 μ diam.), amlullaceous, sometimes with short lateral excrescencies, 42—50 × 12—30 μ; epicutis of pileus not well preserved; hymenophoral trama apparently regular, more yellow towards hymenium, hyphae broader and more hyaline in mediostratum; all hyphae with clamp connections.

Apparently under trees on soil. Wahgi Valley, N. G. (R.E.P. Dwyer 1726) (MICH).

The accompanying notes say "2 specimens, both fragments only, caps and stems black".

It is impossible to guess, with any degree of probability, what genus this is. In many ways this reminds one of *Melanomphalia*, but the cystidia seem to indicate a significant difference, and it is probable that this is a new, hitherto unknown genus of Agaricales. The spore characters will make it easy to reidentify it whenever it should show up in the future, among carefully prepared botanical specimens of hysteria-producing mushrooms from New Guinea.

I have not seen the polypores or other basidiomycetous material, but it may well be that in Dwyer's dried samples the "nonda" or "nondorbingi" was combined with medicinal fungi (also mentioned in earlier reports).

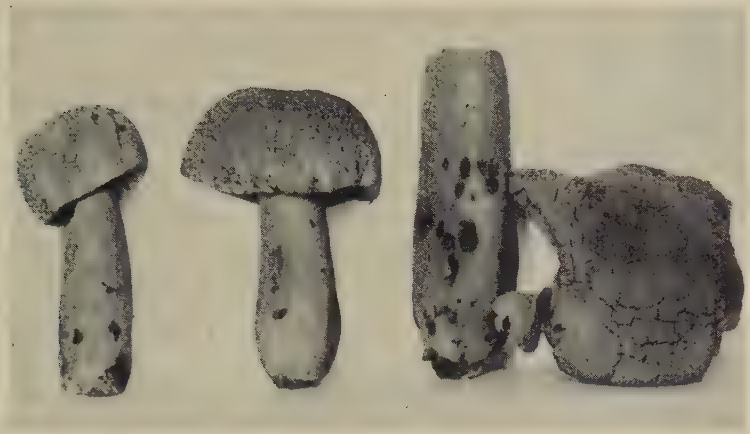


Plate II. *Russula nondorbingi* SING., type specimen, part preserved in liquid, slightly more than ½ natural size. Phot. Dr. ALEXANDER H. SMITH.

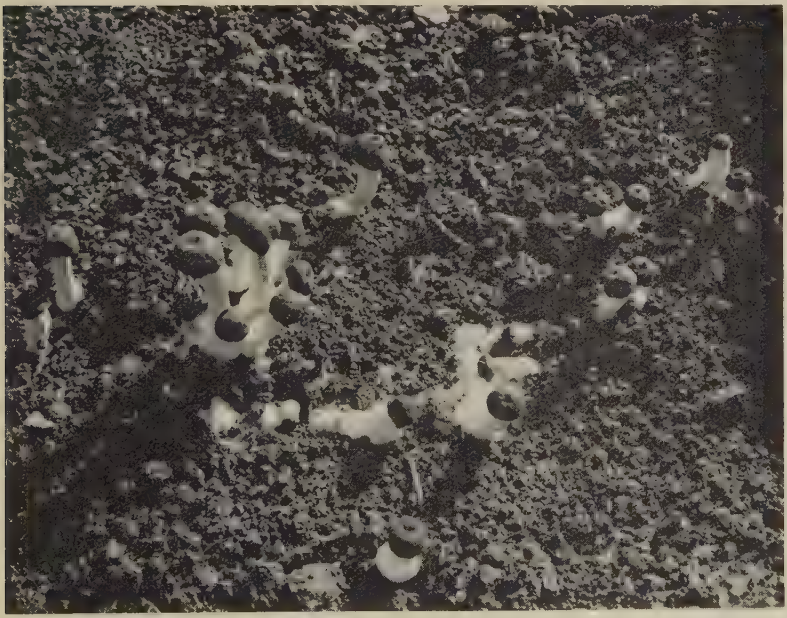


Plate III. *Panaeolus subbalteatus* (BERK. & BR.) SACC. as grown in greenhouse about ½ natural size. Photographic Service Penn. State Univ. B 1071.3, courtesy of Dr. L. R. KNEEBONE.

IV. ABOUT THE IDENTITY OF THE WEED PANAEOLUS OR POISONOUS PANAEOLUS.

Rolf Singer & Alexander H. Smith

It is doubtful whether anybody working directly on the taxonomy of Agaricales will realize how difficult and unsettled many aspects of the systematics of the genus *Panaeolus* have remained. In the first place, taxonomists generally disagree about the generic limits of *Panaeolus*. Fortunately, in whatever concept of the genus the taxonomist maintains the species interesting us here, it will always be a true *Panaeolus* since it agrees with the narrowest concept of the genus. Among the species of that group, the Weed *Panaeolus* is macroscopically remarkable because of the habit which, at first glance, reminds one of *Psilocybe* rather than *Panaeolus*.

Using the English word Weed *Panaeolus* we refer to this species as one of a number of weed fungi found spontaneously like weeds in beds of the cultivated commercial White Mushroom, *Agaricus bisporus* (Lange) Sing. These weed fungi are now generally much less frequent than formerly especially since the adoption by most growers of what is known as the tray method. Among the agaric weed fungi, *Panaeolus* is probably one of the rarest, and even though its physiological action on humans may be described as poisonous, it is not one of the deadly species, and, furthermore, its size, shape and color so diametrically opposed to that of *Agaricus bisporus* that it would be an extremely rare accident — and one due to extraordinary carelessness — to have both harvested together.

This weed *Panaeolus* has been called Poisonous *Panaeolus* by W. A. Murrill in his paper that, for the first time, indicated poisonous qualities in this species. Since no *Panaeolus* had been termed poisonous in the European literature on weed fungi, Murrill believed his species to be new, and he gave a scientific diagnosis for a new species he called *Panaeolus venenosus* Murr. However, the species is neither new, nor limited to mushroom houses. Rather, it is a species rarely found outside the mushroom houses and, apparently, known to European writers long before mushroom growing had become widespread in that continent. It is, consequently, an intruder — like most weeds originally were. The species was formerly known as *Panaeolus subbalteatus*, but we shall redescribe it under this name below, not without cautioning the reader about the possibility that the original type (holotype) of the British species might have been different.

Panaeolus subbalteatus (Berk. & Br.) Sacc., Syll. Fung. 5: 1124. 1887. (Plate 3).

Agaricus subbalteatus Berk. & Br., Not. Brit. Fung. no. 923, Ann. Mag. Nat. Hist. 3rd ser. 7 : 378. 1861.

Panaeolus venenosus Murr., Mycologia 8 : 186. 1916.

Pileus 25—55 mm. broad, hemispheric, conic-truncate or obtusely conic when young, becoming low-campanulate, with umbo or without one, sometimes umbilicate, broadly convex to hat-shaped when mature, sometimes eventually flat with uplifted margin, the latter originally slightly incurved, later straight, surface glabrous, finely rugulose to rugose or even pitted-scrobiculate in center or all over, margin smooth and non-striate but occasionally radially folded dark reddish brown (bay) to partly blackish brown when moist, hygrophanous, fading to "pale ochraceous buff" or "cinnamon buff" (R.), and often retaining a sordid reddish tinge, the marginal zone remaining moist and darker in most specimens (except in giant forms with uplifted margin which dries first) and characterized by showing a water-soaked dark fulvous brown to deep dingy chestnut band, opaque; veil none.

Lamellae young almost semicircular in shape, moderately broad (for a *Panaeolus*) to broad, close or rarely subclose, adnate to broadly adnate or broadly adnexed, dull redish brown or reddish gray, soon spotted with black and finally becoming quite black, but with white edges, often fimbriate. —

Stipe 40—100 × 3—9 mm., mostly equal but also tapering downwards, fistulose-hollow, longitudinally striate at least at the extreme apex, finely whitish pruinose on reddish brown to blackish brown ground, paler above because of the brownish pallid heavy scurfy covering there, and at base because of the white basal mycelium; veil none. — Context mild, inodorous.

Spores 10—15.5 × 6.7—10.5 × (in profile:) 5.5—9.5 μ, most frequently 11—12. 8 × 7—7.7 × 6.5 μ, but varying according to individuals or populations, being 10—12.8 μ long in the type, 11—15.5 μ in Levine's material, and 12—14.7 μ in laboratory-produced young carpophores, 13.3—16.8 μ and elongated in laboratory-produced giant carpophores, lemon shaped, compressed and narrower in profile than in face view, elliptical in profile, with thick deeply pigmented (pigment not visibly soluble in concentrated H_2SO_2) walls which are complex and rigid, with a broad truncate germ pore, smooth, subopaque to opaque, brown-black.

Hymenium: Basidia 20—29 × 8.8—12.3 μ, (2)-4-spored, hyaline, almost clavate. Cystidia none. Cheilocystidia 17.5—45 × 5—15.5 μ either cylindrical or ampullaceous, in the latter case with the narrowed apex 4—21 μ long and 3.5—6.5 μ thick, hyaline, obtuse, making the edge heteromorphous.

Hyphae: Subhymenium fuscidulous, of small elements. Hymenophoral trama regular. Covering of the base of the stipe made up of interwoven, irregular but elongated, mostly filamentous hyphae, very few elements vesiculose at times. Epithelium of pileus consisting of balloon shaped vesiculose cells, e. gr. 21 × 17.5 μ, or 27.5 × 27 μ. All hyphae with clamp connections.

Dermatocystidia: Scurfiness of apex of stipe caused by very crowded dermatocystidia, with the shape of cheilocystidia and hyaline, but generally reaching greater lengths (up to 60 μ).

On open ground especially on freshly manured beds, lawns, on straw piles, on manure heaps, on compost of all kinds, on roadsides, and in mushroom houses on the casing, usually gregarious, fruiting outside from spring until fall, in mushroom houses practically all year, naturally occurring in Europe, North America, South America[1] and perhaps Asia and Africa.

Material studied: MASS.: Cambridge 6—18—1911, L. C. C. KRIEGER, comm. KELLY 783 (MICH). — *Maryland*: Tacoma Park, 6—9—1919, C. H. KAUFFMAN, conf. A. H. SMITH (MICH) — *Ohio*: Cleveland 6—2—1943, M. B. WALTERS, conf. A. H. SMITH (MICH). — *Mich.*: University of Michigan campus, A. H. SMITH 331114 (MICH), and numerous other collections from that neighborhood, including specimens grown from cow dung by V.P. 6721 (MICH), e. gr. A. H. SMITH 57, 6486, 18527 (MICH. — Manitou Camp, Cheboygan Co., June and July 1946, A. H. SMITH 21535, 21609, 21674, 21723 (all MICH). — *Wash.*: Olympic Mountains, 10—24—1935, A. H. SMITH 3319. (MICH). — CANADA, Ont. Ottawa, Central Experimental Farm, GROVES & PRODAB, conf. SMITH, herb. no. 16280. (MICH). — ARGENTINA, Buenos Aires, comm. A. MARTINEZ; — Tucumán R. SINGER T 1211 (MICH).

Material studied of *Panaeolus venenosus* MURR. and found to be identical with the material enumerated, above: N.Y.: Pelham Manor, type and para-type or authentic, Hatch, det. MURRILL (NY). — (No locality given), November 17, 1917, M. LEVINE (NY), — *Ill.* Material grown in laboratory conditions on horse manure compost, University of Illinois Pharmacy School, Chicago, from material originally isolated by L. R. KNEEBONE, Pennsylvania State University, comm. Singer (MICH).

Illustrations: LEVINE in: Bull. Torr. Bot. Cl. 46, plate 3; SMITH in: Annales Mycol. 32, plate 9, fig. 2.; BRODIE in: Canad. J. Research 12, pl.1, 1935.

The Illinois material furnished, among innumerable normal carpophores, a smaller number of giant carpophores which tend to have uplifted margin of the pileus and a somewhat restricted spore production. Some material from Cleveland was an entirely sterile population of this kind. Another interesting observation on the Illinois material consisted in pointing out a single carpophore among hundreds which had a cesious to bluish base. This, in the light of BRODIES observations on material received by him from A. H. SMITH, would be interpreted as reflecting the presence in some of the cultures of sclerotia which, in this one case, "germinated" to produce a fruiting body rather than vegetative material as they did in the pure cultures. BRODIE reports (Canad. J. Res. 12: 657—660. 1935) that both the haplophytes (primary mycelia) and the diplophytes (secondary mycelia) produce sclerotia of a striking greenish-blue color. The production of sclerotia was occasionally restricted to certain sectors of a Petri dish. This would indicate that the formation of sclerotia is the result of changes brought about — and often easily controlled — but similar to minor mutations, restricted to certain sectors of a dish and at first appearing to occur strictly spontaneously. This phenomenon, often seen in *Agaricus* cultures, is referred to by mycologists as sectoring.

---

[1] As is the case with many dung-inhabiting species, it is now almost impossible to even guess its geographic origin since it might have been introduced with cattle and horses (cf. SINGER in: Mycologia 45: 867, 1953).

The blue color of the sclerotia and of the base of one single specimen harvested at Chicago appears to be of the same nature as the bluing in *Copelandia cyanescens* (BERK. & BR.) SING. and the bluing Psilocybes. If this assumption is correct, it must become quite clear that a direct or indirect relation must exist between the bluing capacity of a species and its capacity to provoke cerebral mycetisms. On the basis of this hypothesis it is actually possible to predict which genera and species might be significant for the research on cerebral mycetisms of the type represented by *Panaeolus subalteatus* and *Psilocybe caerulescens*. This would then include such species as: *Copelandia cyanescens*, *Pholiotina*, all species of: *Psilocybe* sect. *Caerulescentes*, and possibly even Mycenas of the group *M. cyanorrhiza*.

BRODIE also showed that *Panaeolus subalteatus* is heterothallic and tetrapolar — data which coincide with those obtained on the *Psilocybe* studied by us. His cultures were on malt extract agar, as were those received from Dr. KNEEBONE, and those initiated by us.

At present, SINGER and AMES are growing abundant mycelium in liquid shake cultures of a modified Czapek with 1 % sucrose and 1½ % malt extract and 1½ % yeast extract. Preliminary tests seem to indicate that the physiological activity producing cerebral mycetisms is maintained in both carpophores and mycelium.

The species has, in the past, often been confused with "*Panaeolus campanulatus*", a species which, according to the rules of nomenclature cannot bear this name and which, if considered conspecific with *Panaeolus sphinctrinus* (FR.) QUEL. should be known under this latter name, and if not as *Panaeolus linnaeanus* IMAI.

COOKE has (Illustr. Brit. Fungi, pl. 631 B) illustrated *P. subalteatus* in such a manner as to suggest that his specimen was not the same as the one we have described above and which is conform with the tradition of European and American literature (RICKEN, LANGE, SMITH. etc.). Rereading BERKELEY & BROOME's original diagnosis, we find that it is not completely in agreement with our interpretation, yet the differences are minor and might be considered as mere exaggerations. The pileus is indicated as fading to pallid and the stipe as short fibrillose. A pallid effect is often obtained if the pileus is, on drying, also finely cracked and rivulose, as is often the case in out-of-door specimens, and thus a paler impression is transmitted because of the white of the trama of the pileus showing between fragments of cuticle. As for the fibrillosity, it is easy to describe the scurfiness of the apex of the stipe in this manner, and although the scurfiness diminishes away from the apex, BERKELEY & BROOME may have missed this finer point of observation. Consequently, unless and until a detailed type analysis shows that the holotype of *Agaricus subalteatus* (K) is anatomically different from the species we have described and discussed above, we shall continue to consider the RICKEN-LANGE interpretation as sound and valid.

TAUROCHOLATE AGAR FOR CHLAMYDOSPORE PRODUCTION BY CANDIDA ALBICANS

by

F. Raubitschek, M.D.

(4.IV.1958)

(*From the Department of Dermatology and Venereology* (Felix Sagher, M.D., Director) *Hadassah University Hospital, Jerusalem, Israel*)

Early production of chlamydospores by a strain of *Candida* is the quickest way of its identification as *C. albicans*. Sugar fermentation tests are both time consuming and require pure cultures. Several methods for the early induction of chlamydospore production have been devised (2, 3, 4, 6, 7, 8, 9, 10). Aschner (1) reported the ease and speed of chlamydospore production of *C. albicans* strains on Sodium taurocholate agar and this report compares the use of his simple medium in the routine identification of *Candida* strains from various clinical sources with sugar fermentation tests of the same strains.

Methods and Materials

The taurocholate medium ("tch") consisted of 1 % sodium taurocholate c.p., 1.8 % agar, in distilled water. After sterilisation 10 to 15 ml. portions of the medium were poured into petri plates and the plates left standing until solidification of the agar. The strains of *Candida* were isolated from skin, nails, nail folds, mucous membranes, sputum, bronchial washings, and stools, on 2 % glucose agar with or without the addition of antibiotics. The strains were processed in the usual manner (6). After two to three days of incubation of the primary isolates the growth was transferred directly to one sector of the tch-agar plate by three short streaks with a needle. Each plate accomodated six strains. After incubation at 26° C for 24 to 48 hours the unopened plates were put bottom up on the stage of the microscope and the strains examined under low power. Filament formation and abundant chlamydospores could be easily seen at the edges of the streaks. The results of the routine identification procedures were compared with the results of the tch plates.

Results

TABLE I

Results of Routine Identification and Chlamydospore Formation in 227 strains of Candida.

	Number of strains	Chlamydospores on tch Number
Candida albicans	212	165
Candida tropicalis	9	9
Candida species [1].	3	3
Candida unidentified [2] . .	3	3
Total	227	180

[1]) other than *albicans or tropicalis.*

[2]) due to heavy contamination.

The 9 *tropicalis and the* 3 *Candida* species were isolated from the lesions in mixed colonies. During the purification process the *Candida albicans* colonies were apparently missed.

Chlamydospores thus appeared in 79 % of all *Candida* strains examined and in about 78 % of the *Candida albicans* strains.

Comment

The necessity for purification of yeast like fungi grown from clinical material delays identification considerably. The growth of more than one strain in the same primary colony involves an additional danger. Too early picking of young colonies from the purification plate can easily lead to the loss of one or more species, and to the identification of a nonpathogen only (see results). The tch medium being of poor nutritional quality and not containing reducing carbohydrates, does not encourage the growth of contaminants. It apparently enhances chlamydospore formation by a lowering of the surface tension (5). These facts make it particularly suitable for the rapid identification of *Candida albicans* in contaminated and mixed colonies.

Summary

Results using a simple medium which encourages rapid formation of chlamydospores in *Candida albicans* and allows the use of contaminated or mixed primary isolates of *Candida* strains are described.

Literature Cited

1. Aschner, M. (1956) A simple Medium for Chlamydospore Formation of Candida albicans. Proc. Coment. Scient. Soc. Bull. Res. Council Israel.
2. Gordon, Morris a., Bradley, E. G. & Grant, V. Q., 1952. The Influence of Different Types of Corn Meal Agar upon Chlamydospore Production by Candida Albicans. J. Lab. Clin. Med. **40,** 316—320.
3. Kligman, Albert M. (1955). Aids in Technic in the Identification of Candida albicans. J. Invest. Dermat. **14,** 173—176.
4. Nickerson, Walter J. & Mankowski, Z. (1953) A Polysaccharide Medium of Known Composition Favouring Chlamydospore Formation in Candida albicans. J. infect. Dis. **92,** 20—25.
5. Pavaltou, M. & Marselou, U. (1957) Sur le role de la bile dans le milieu PCB. Autres substances qui favorisent la production de chlamydospores par Candida albicans. Ann. Inst. Pasteur **93,** 146—149.
6. Raubitschek, F. (1945) A New Fermentation Method for Mycological Identification. J. Bact. **50,** 337—339.
7. Reid, Douclas J., Jones, M. M. and Carter, E. B. (1953) A Simple Clear Medium for Demonstration of Chlamydospores of Candida albicans. Amer. J. Clin. Path. **23,** 938—941.
8. Taschdjian, C. L. (1953) A Simply Prepared Identification Medium for Candida albicans. Mycologia **45,** 474—475.
9. Taschdjian, C. L. (1957) Routine Identification of Candida albicans: Current Methods and a New Medium. Mycologia **49,** 332—338.
10. Weld, J. T. (1952) Candida albicans. Rapid Identification in Pure Cultures with Carbon Dioxide on Modified Eosin-Methylene Blue Medium. A. M. A. Arch. Dermat Syph. **66,** 691—694.

MICROSPORIE OBSERVEE CHEZ UN GROUPE DE LIONS EN CAPIVITE

(Foyer épizootique déterminé par Microsporum lanosum)

par

A. Avram, I. Alteras, M. Carjewschi & M. Ilescu
(*Travail du Centre Dermatologique de Bucarest. Directeur*: *Prof.* Stef. Gh. Nicolau).

(24.IV.1958)

L'histoire des dermatomycoses chez les animaux sauvages est encore à écrire, étant données leurs conditions particulières d'existence qui les font échapper à notre observation.

Ayant eu récemment l'occasion d'enrégistrer l'apparition d'un foyer épizootique de microsporie chez un groupe de lions en captivité, il nous a paru intéressant d'en rapporter ici les détails.

Le 7 Janvier 1958 on nous a apporté, afin de préciser le diagnostique, deux lionceaux, provenant de la ménagérie d'un cirque de Leipzig, arrivé depuis peu en tournée dans notre Capitale. A l'examen des animaux en question nous constatâmes l'existence de lésions circulaires, d'aspect tondant, disséminées sur des régions différentes du corps. L'examen microscopique des poils récoltés des lésions nous a permi d'établir le diagnostique de microsporie.

La constatation de cette dermatomycose, tellement contagieuse, chez les animaux qui nous ont été présentés, nous a conduit d'étendre nos investigations sur le reste des lions constituant le lot de cette entreprise. A la suite du contrôle fait sur place, nous avons constaté encore 4 lionceaux et parmi les lions adultes malades 15 sur le nombre total de 19 existants.

L'observation de la dermatomycose chez cette espèce d'animal sauvage étant, autant que nous sachions, un fait inédit, il nous a paru intéressant d'en entreprendre une étude clinique, mycologique et épidémiologique plus détaillée.

Étude clinique

Les lésions observées par nous se présentaient sous l'aspect de placards ronds ou ovalaires, de dimensions variables, couverts de squames blanchâtres, au niveau desquels les poils étaient rompus à 4—6 mm. de leur émergence folliculaire et entourés d'une gaine grise, pulvérulente. Cet aspect était de tous points semblable à la tondante microsporique, telle qu'on la rencontre dans le cuir chevelu de l'enfant, chez le chat ou chez le chien.

Le nombre de lésions, ainsi que leur dimensions, étaient variables, suivant qu'il s'agissait de lionceaux ou de lions. Chez les lionceaux les placards microsporiques, mesurant en général 3 à 14 cm. de diamètre, se trouvaient parfois disséminés sur presque toutes les régions du corps, c'est-à-dire intéressant l'extrémité cephalique (joues, front, nez, oreilles), le tronc, l'abdomen, le dos, les flancs, les membres, les pattes et dans un cas même la queue. La plus constamment atteinte était l'extrémité cephalique, ensuite le tronc et plus rarement les membres (fig. 1—4).

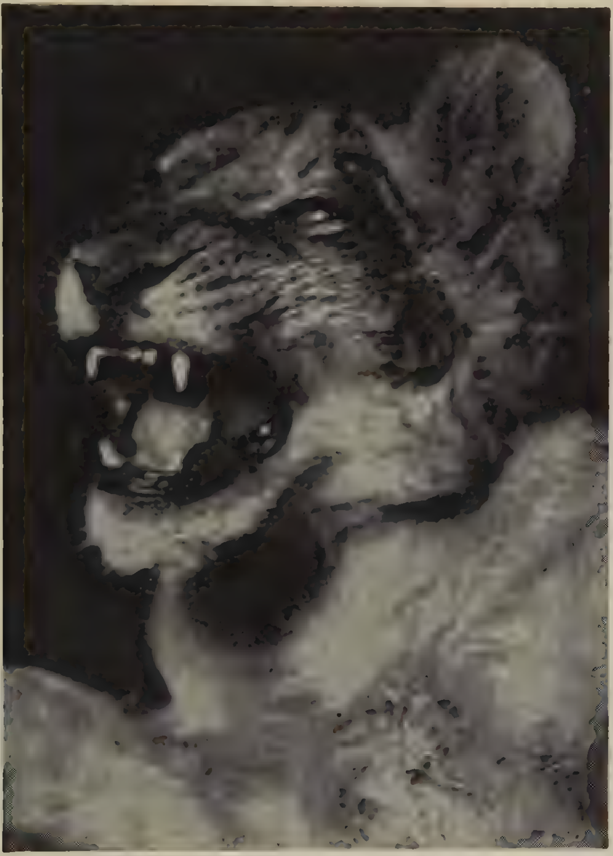


Fig. 1. Placards d'aspect tondant sur les joues (le lionceau Alex).

Le nombre de placards variaient, suivant les cas; chez un des lionceaux leur nombre s'élevait à 27.

Chez les lions adultes les lésions étaient beaucoup moins importantes, se réduisant à 2—4 placards d'aspect régulièrement rond ou ovoïde, dont le diamètre ne dépassait pas 3 cm. La localisation

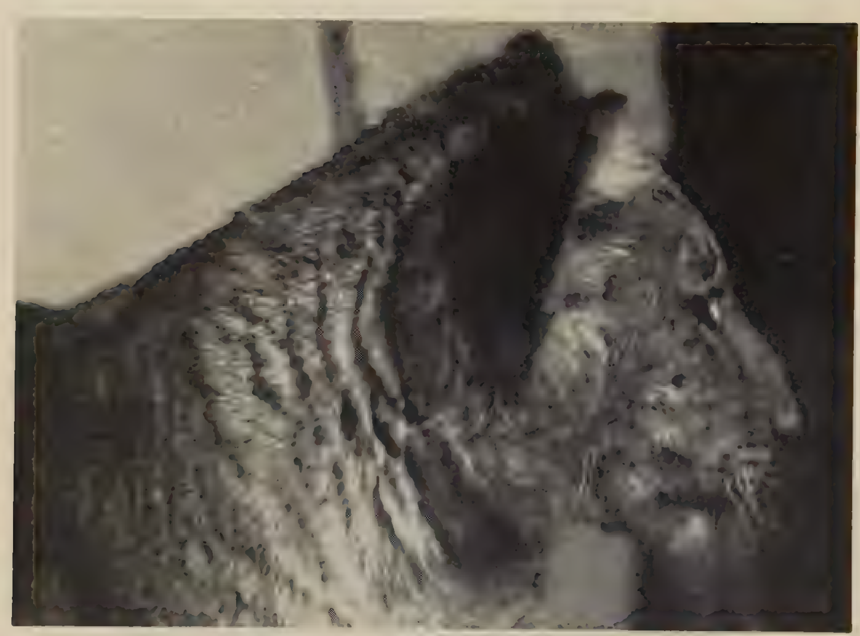


Fig. 2. Lésions microsporiques de dimensions variables sur les joues et sur le front (le lionceau Sultan)

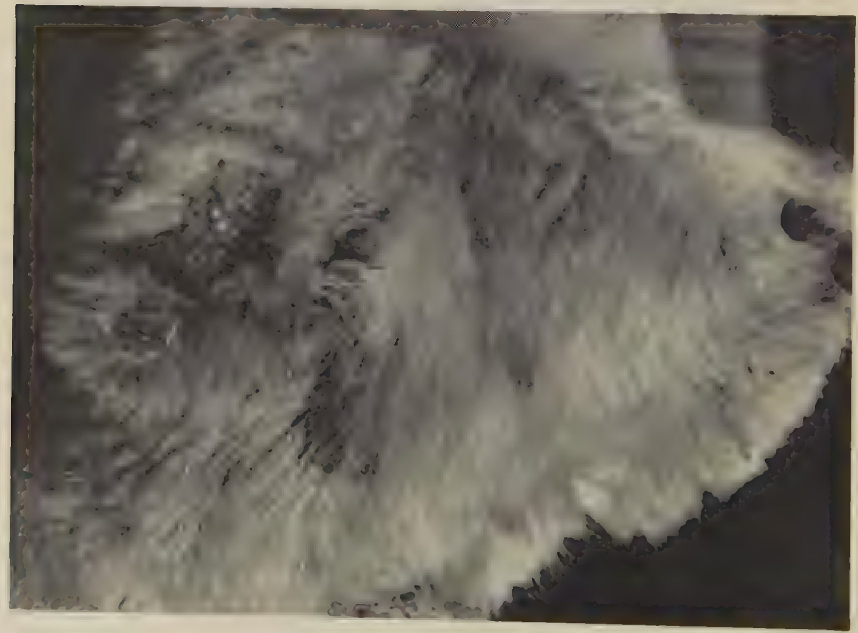


Fig. 3. Mêmes lésions situées sur le pavillon de l'oreille (le lionceau Sultan).

principale était représentée par l'extrémité cephalique et surtout la région péri-orbitaire: Plus rarement les lésions se localisaient sur le tronc.

L'existence des lésions chez les lions adultes, quoique plus discrètes comme nombre et dimension que chez les lionceaux, montre que contrairement à se qui se passe chez l'homme, une immunité absolue contre les mycoses pilaires ne se devellope pas chez les lions, comme d'ailleurs chez d'autres animaux de laboratoire ou domestiques réceptifs.

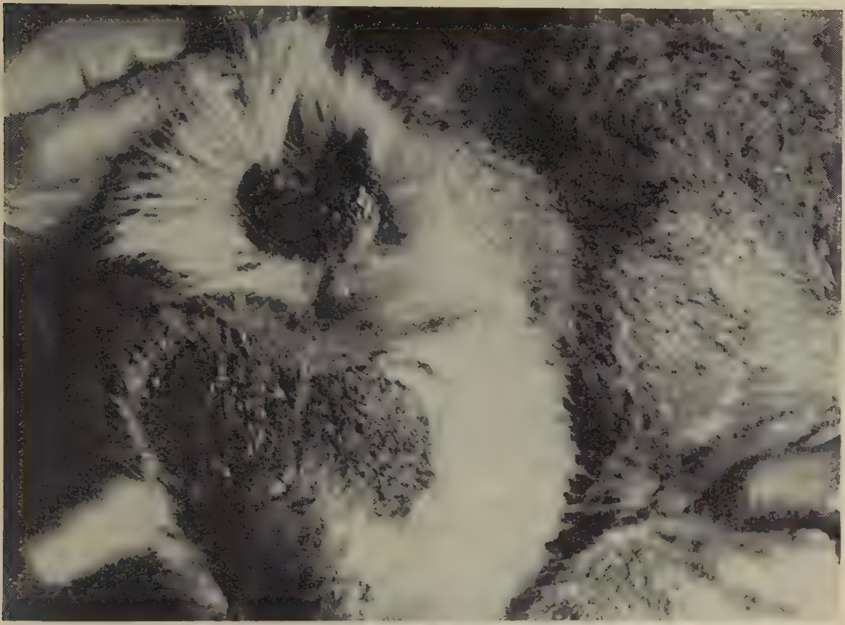


Fig. 4. Placards microsporiques situés au niveau du vertex et à la base du pavillon de l'oreille (le lionceau Nero).

ÉTUDE MYCOLOGIQUE.

L'aspect microscopique des poils parasités

L'examen microscopique des poils parasités, dissociés par le sulfure de soude 10 $^0/_0$ ou par le chloral-lacto-phénol, montrait un parasite de type microsporique, à gaine sporulaire caractéristique, composée de spores disposés en mosaique, mesurant chacun de 2 à 4 μ et présentant une image conforme à celle trouvée dans les cheveux parasités de la microsporie de l'homme, du chat et du chien (fig. 5).

Les cultures du champignon.

Tous les poils parasités récoltés des animaux malades et ensemencés sur le milieu d'épreuve de Sabouraud ont donné constamment une culture de *Microsporum lanosum*-Sabouraud 1907 (synonymes: *Microsporum canis*-Bodin 1897; *Microsporum felineum*-Fox & Blaxall 1896).

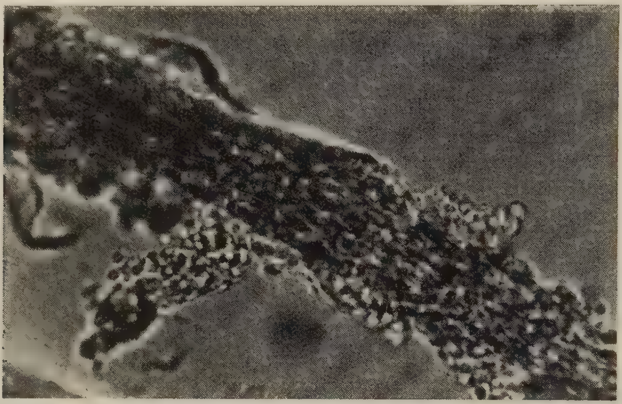


Fig. 5. Cheveu microsporique de lionceau.

Les colonies devenaient visibles au bout de 3 à 4 jours, atteignant 3 cm. de diamètre au bout d'une semaine. L'aspect des colonies était classique caractéristique, sous la forme d'un disque plat, sans plis, avec un bouton central, parfois avec une zone centrale poudreuse, de couleur jaune-chamois et une zone externe, constituée par un duvet long, disposé en fines radiations périphériques. Le revers de la colonie est jaune-citron (fig. 6).

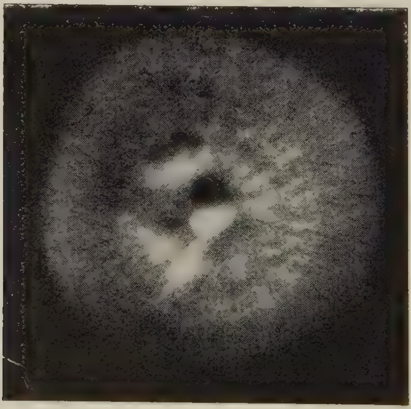


Fig. 6. *Microsporum lanosum* — culture de 18 jours sur gélose glucosée Sabouraud (isolée de lionceaux).

Les caractères microscopiques de la culture montrent un mycélium rectiligne, de 2 à 3 μ de diamètre, septé, à extrémité parfois en raquette. Rares aleuries piriformes et de très nombreux fuseaux en navette, à parois verruciforme et divisés par des septums en 9 à 13 logettes (fig. 7).

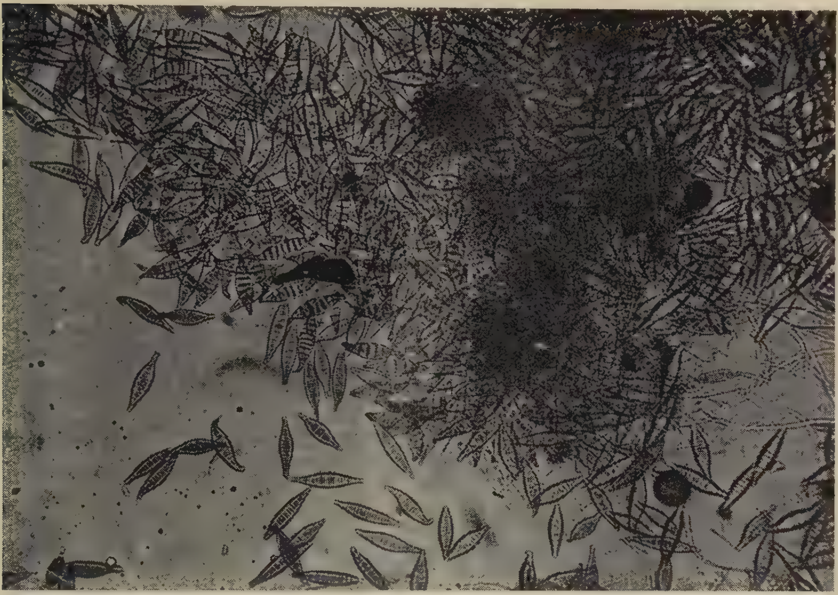


Fig. 7. Même culture; aspect microscopique: nombreux fuseaux en navette.

Inoculation expérimentale à l'animal.

Des cultures jeunes, obtenues de la souche isolée des lions malades ont été inoculées au cobaye, au chat et au chien.

L'inoculation a été faite après épilation préalable des régions choisies (la région dorsale chez le cobaye, l'extrémité cephalique chez le chat et le chien) par une pâte à sulfure de soude 15 %. Sur la peau des régions ainsi épilée et légèrement escoriée au papier de verre, il a été déposé des fragments de culture, triturée et mélangée à une portion de milieu solide de Sabouraud et recouverte d'un emplâtre adhésif.

Les inoculations ont été suivies de résultats positifs chez tous les animaux en expérience. Au bout de 7 jours on pouvait déjà observer des lésions circulaires visibles, qui après autres 7 jours étaient parfaitement constituées, les poils parasités ayant leur gaine pulvérulente caractéristique (fig. 8—9).

Les placards examinés à la lumière de Wood montraient une belle fluorescence verdâtre brillante.

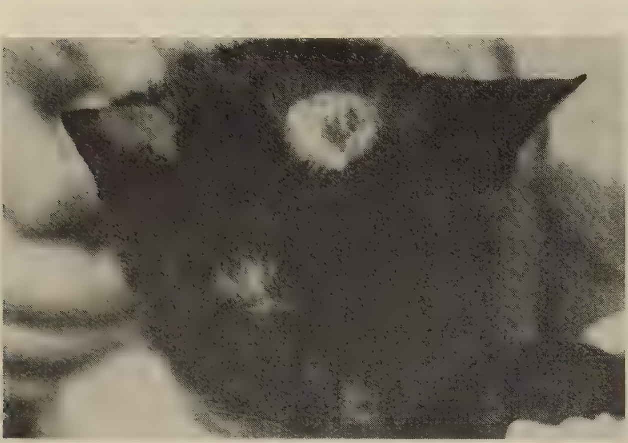


Fig. 8. Inoculation au chat; placard d'aspect tondant sur l'extrémité cephalique.

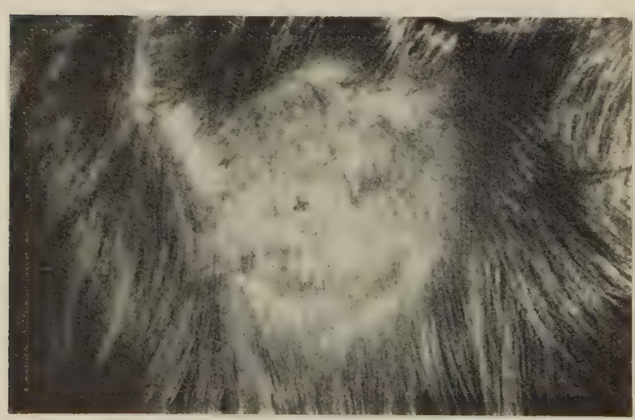


Fig. 9. Inoculation au cobaye; lésion tondante sur le dos.

Inoculation à l'homme.

En utilisant la technique décrite, l'inoculation à un volontaire, sur la face antérieure de l'avant-bras, a été suivie aussi de résultats positifs. Au bout de 6 jours on pouvait observer l'apparition d'un ,,herpès circiné'', bordé par quelques vésicules périphériques (fig. 10). Cette lésion a été rapidement guérie par l'application d'une solution d'alchool iodé 1 %.

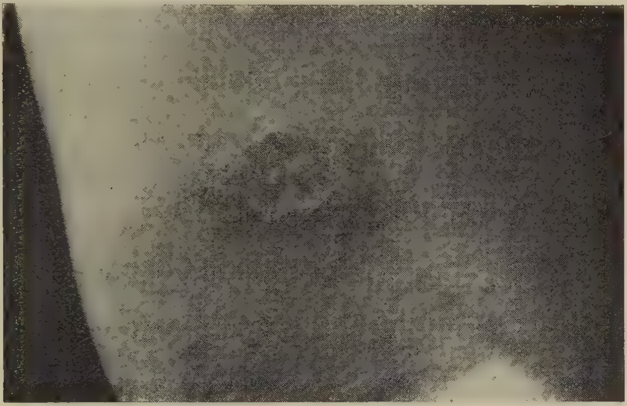


Fig. 10. Inoculation expérimentale à l'homme: ,,herpès circiné'' sur l'avant-bras.

Les rétrocultures en partant des poils parasités du cobaye, du chat et du chien, ainsi que des vésicules de la lésion humaine ont toujours réproduit l'espèce initiale.

CONSIDÉRATIONS D'ORDRE ÉPIDÉMIOLOGIQUE.

Le foyer épizootique dont nous avons parlé a été observé approximativement 40 jours après l'arrivée du cirque auquel les lions appartenaient.

Étant donné la durée de la période qui a précédé l'apparition de la maladie, il est probable que la contamination s'est opérée sur place.

La courbe de l'épizootie a atteint son maximum entre le 27 Décembre 1957 et le 7 Janvier 1958, fait qui a coincidé avec la dispersion de l'infection chez tous les 6 lionceaux et chez les 15 de 19 lions adultes. Passé ce terme, nous n'avons plus constaté l'apparition de nouvelles lésions chez nos animaux.

En ce qui concerne la source de contamination il nous a été impossible de la préciser.

Nos investigations ont permis d'établir les circonstances suivantes:

1. Aucune autre espèce animale n'est venue en contact direct avec les lions malades.

2. L'alimentation des lions était constituée exclusivement par de la viande de cheval crue.
3. La litière était formée par de la sciure de bois de sapin, pendant la journée, et par de la paille, pendant la nuit, les deux étant changées tous les jours.
4. Le dresseur et le surveillant des lions n'avaient pas contracté la microsporie.

La contamination de ces animaux n'ayant pu être faite par une autre espèce ou par l'homme, on est conduit de supposer une contamination réalisée par de spores se trouvant à l'état de saprophytes dans la litière.

On sait que beaucoup de spores des dermatophytes peuvent rester vivants pendant des mois et même des années dans les produits ayant servi comme litière aux animaux.

La grande réceptivité de cette espèce animale pour la microsporie n'est pas faite pour surprendre, étant donné son appartenence à la classe des felinées. Nous savons, en effet, que le chat, le représentant domestique de cette classe animale, est fréquemment atteint par la microsporie due au *Microsporum lanosum* et qu'il constitue même la source principale des contaminations humaines.

L'apparition de la maladie sous forme d'épizootie peut être expliquée, dans le cas présent, non pas seulement par la réceptivité particulière de l'espèce, mais aussi par les conditions de cohabitation de ces animaux.

Ainsi, il faut mentionner que 15 des lions adultes habitaient un même vagon divisé en plusieurs cages grillagées, dans chaque cage étant parqués 4 à 5 animaux. D'autre part, les 6 lionceaux étaient amenés chaque jour, et à plusieurs reprises, dans la cage des lionnes mères. Ajoutons encore que pour les animaux adultes le contact était possible tant dans le vagon que dans le manège, pendant leur exhibition.

Cette manière de cohabitation explique la rapide extension de la maladie chez tous les animaux — jeuns et adultes — étant logés, en condition de promiscuité, dans le même vagon.

Les autres 4 lions adultes, les seuls restés indemnes, habitaient un autre vagon et n'étaient non plus utilisés, pour le moment, aux exhibitions, fait qui les isolaient complètement des autres animaux.

En ce qui concerne le fait que le dresseur et le surveillant, les seuls personnes qui venaient en contact avec les animaux malades, sont restés indemnes, est assez curieux, la souche isolée des lions s'étant montrée expérimentalement pathogène pour l'homme.

Le sexe des animaux n'a absolument rien influencé la réceptivité envers l'infection, celle ci intéressant dans une proportion presque égale (8 femmelles pour 7 mâles) les deux sexes.

L' âge aussi n'a joué aucun rôle dans la réceptivité, l'infection ayant frappé, dans une égale mesure, les animaux agés à peine de quelques mois, que les lions agés, en l'espèce de 3 à 5 ans (un seul d'entre eux avait l'âge de 8 ans), mais les lésions étaient bien plus discrètes chez ces derniers.

Les lions faisant l'objet de cette étude étaient tous de race sénégalaise.

Les animaux malades ont été traités par de badigeonnages à la solution de Thiotal (produit doué d'action fongicide) et par des injections de vitamine B[1]. En même temps on a amélioré l'hygiène de la litière, qui était changée plus souvent. Sous l'influence de ce traitement qui est en cours d'application, quelques uns de placards ont disparus et les autres se sont arrêtés dans leur évolution.

CONCLUSIONS

1. Les auteurs rapportent le fait inédit de l'apparition spontannée de la microsporie chez le lion en captivité, sous la forme d'un foyer épizootique survenu chez 21 animaux (6 lionceaux et 15 adultes) appartenant au lot animalier d'un cirque.
2. La forme clinique observée était celle classique de la tondante microsporique.
3. L'agent pathogène isolé a été *Microsporum lanosum*. Ses cultures inoculées au cobaye, au chat, au chien et à l'homme ont été suivies de résultats positifs.
4. Principallement le lion pourrait donc aussi jouer, comme d'autres animaux, un rôle dans la propagation des dermatophytes dans la nature.

SUMMARY

Tinea microsporina observed in a group of lions in captivity

(Epidemic focus caused by *Microsporum lanosum*)

The authors report the original observation of an epidemic focus of tinea microsporina in a group of lions belonging to a circus from Leipzig, which came to Bucarest. The infection attacked 6 lion cubs and 15 lions (from a total of 19 adults).

The clinical form was a classic tinea microsporina, with numerous large crusted areas, spread on the cheeks, forehead, ears, abdomen, paws and sometimes on the tail. In the adult lions the lesions were much more discrete as to number and size than in the lion cubs.

The infected hairs, picked from the lesions, were of *Microsporum* type, surrounded by a thin white sheath of fungus spores, packed closely together without apparent order. At Woodlight, they showed a brillant greenish fluorescence.

The isolated species was *Microsporum lanosum* — SABOURAUD (1907) — synonyms: *Microsporum felineum* — FOX & BLAXALL 1896; *Microsporum canis* — BODIN 1897. Inoculations into cat, dog, guinea-pig and man were positive, producing the characteristic

lesions of tinea tonsurans microsporina and herpes circinatus in both animal and man.

The transfer made from the experimental lesions reproduced the same strain first inoculated.

The investigators were not able to determine the source of infection; they could only establish that it was not transmitted from man or from other animal. The lion's food consisted of crude horsemeat only and the few men who came in contact with the lions, during the exhibitions, were not affected by the infection. The contact of the lion cubs with the adults, that happened in the arena and in the wagons where they lodged, promoted the extension of the disease to almost all the lions of the circus.

The treatment of the lions was made with a solution of Thiotal (a product with fungicidal properties) and with vitamine B^1 injections. At the present most of them are cured.

The authors conclude that the lions would also have their place (like other animals) in the spreading of the dermatophytes in the nature.

BIBLIOGRAPHIE

O'CONNOR, PATRICIA. (1955) A bibliography of references to Diseases of Wild Animals and Birds. — Amer. J. Vet. Res.

THE ETIOLOGY OF INTERSTITIAL PNEUMONIA

Identification as *Hansenula anomala* of a yeast isolated from lungs of infants

by

C. J. K. WANG & JAN SCHWARZ

(15.IV.1958)

Interstitial plasmacellular pneumonia has become a major cause of mortality of infants in Europe and therefore has aroused considerable attention and interest here and abroad. (1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28). The etiologic agent of this disease, however, has not yet been well established. JÍROVEC et al suggested a protozoon named *Pneumocystis carinii* (19, 20, 21, 26, 27, 28) thus the disease is often called Pneumocystis pneumonia. GIESE (12) on the other hand, isolated a yeast called *Saccharomyces octosporus* from lungs of 5 fatal cases of interstitial pneumonia. Nevertheless, he failed to induce the disease experimentally. CSILLAG & BRANDSTEIN (4, 5, 6) attributed the disease to a *Saccharomyces* sp. which was cultured from lungs of premature infants who died of interstitial pneumonia in Budapest. The disease was induced in mice by inhalation of the fungus suspension, though the characteristic "foam substrate" of this disease was not seen. They found blastospores and "asci" in lung smears of mice. KOVAC & KUNZ (22) isolated a yeast from the lungs of 5 premature infants who were victims of interstitial pneumonia in Vienna, which exhibited a greater virulence in vitro than the "Budapest yeast".

In this paper are presented findings of our study of the "*Saccharomyces* sp." isolated by CSILLAG from a fatal case of interstitial pneumonia in Budapest.¹)

MATERIALS AND METHODS

Cultures used in tests

The culture of "*Saccharomyces* sp." (in the following pages referred to as "Budapest yeast") from Dr. CSILLAG was purified by

---

¹) The culture was obtained through Dr. W. KOVAC from the Hygiene-Institute of the University of Vienna.

From the Clinical Laboratories, Jewish Hospital, and the Laboratory of Mycology, Cincinnati General Hospital (Departments of Dermatology and Pathology), Cincinnati, Ohio.

This investigation was supported in part by Research Grants (E-576) of the National Institutes of Health, Department of Health, Education, and Welfare and the Brown-Hazen fund.

using a serial dilution technique with Sabouraud's glucose agar as the plating medium. Individual well-separated colonies were subcultured in pure forms. The purified cultures (subcultures A and B) and the original culture together with one *Candida albicans* and one *Saccharomyces carlsbergensis* (ATCC 9080) were systematically investigated. Identification of the yeasts was based mostly upon the criteria in LODDER & KREGER'S "The Yeasts, a taxonomic study" (23).

Morphologic studies

Difco yeast morphology agar was used for studying the gross characteristics of the colonies and the microscopic morphology of the yeasts.

Ascospore formation was observed on Gorodkowa agar (23). All cultures were incubated at 25° C. and examined twice weekly.

Physiological properties

Fermentation tubes containing Difco phenol red broth base plus a 2 % concentration of each one of the following sugars: glucose, galactose, sucrose, maltose, lactose, and raffinose were used for studying the fermentative ability of the yeasts. One tenth ml. of a heavy yeast suspension in saline was inoculated in duplicate into each sugar medium. Tubes were kept at 25° C. and examined twice weekly.

Utilization of potassium nitrate was done by BENHAM'S method (3). Difco yeast carbon base was made in 10 times strength with the addition of potassium nitrate and was then filtered through a Seitz pad. Two ml. of the sterilized solution were placed in a Petri dish and 18 ml. of melted and cooled, purified agar (2 %) were added and thoroughly mixed with the yeast carbon base medium. The sugar assimilation test was done in a similar way as above by using Difco yeast nitrogen base with the addition of each one of the following sugars: glucose, galactose, sucrose, maltose, and lactose. The plates were streaked with each of the cultures and incubated at 25° C.

Animal experiments

1. Ten male, 18 gram mice were injected intravenously each with 0.1 ml. of subculture A and 10 mice with subculture B. One mouse from each group was sacrificed at 2 to 3 days intervals. Cultures were made from liver and spleen on Sabouraud's glucose agar. The liver, spleen, and lungs of each animal were fixed in formalin (10 %) and sectioned for microscopic examinations.
2. Six litters of 24 hours old suckling mice, 6 to 13 mice per litter were infected daily by the intranasal route with the "Budapest yeast" suspension in saline. The yeast was grown for 1 to 5 days on Sabouraud's glucose slants. One litter of 9 suckling mice was used as control and infected similarly with *C. albicans* suspension in saline.

One "*Budapest yeast*" mouse and one "*Monilia*" mouse were sacrificed daily and smears were made from the lungs which were stained according to Giemsa's method. Microscopic slides also were prepared from fixed specimens of lungs. Hematoxylin-eosin, Gridley's (13) and Grocott's (14) techniques were used for staining the slides.

RESULTS AND DISCUSSION

Two types of colonies were found on Sabouraud's glucose agar by the dilution technique. One type of colonies exhibited a juicy, shiny appearance (subculture A), the other type was shiny at first, but became dull at the end of 3 or 4 days (subculture B). Upon re-purification of these two types of colonies, those characteristics remained in the subcultures. On yeast morphology agar, the subculture A was creamy, waxy and less shiny than that on Sabouraud's glucose agar, whereas subculture B was whitish and very dull or membraneous. The original culture was whitish dull on yeast morphology agar.

The original culture, subcultures A and B all showed oval or spherical yeast cells with some elongated ones (Table I). They reproduced by budding.

Table i.

Morphologic studies on the strain isolated by Csillag *and* Brandstein *from "pneumocystis-pneumonia"* 1)

	Colonies on Yeast morphology agar 3 days	Lacto-phenol cotton blue mounts measurements in microns	Gorodkowa agar 1–2 weeks
Original culture	dull, whitish	cells round to oval, budding (2–5) × (3–7.5)	hat-shaped ascospores 1–2 per ascus occasionally 3
Subculture A	waxy, creamy		
Subculture B	dull, whitish		
C. albicans	shiny, juicy, whitish	round to oval budding 3.8 × 5.7	no ascospores seen
Saccharomyces carlsbergensis	shiny, juicy, yellowish	oval, spherical, cylindrical, budding (2.8–4) × (5.7–9.5)	spherical ascospores, 1–2 per ascus

1) identified by us as *Hansenula anomala* (Hansen) H. & P. Sydow.

On Gorodkowa agar at 1 to 2 weeks, all 3 cultures revealed hat-shaped ascospores (1—3 per ascus) (Fig. 1).

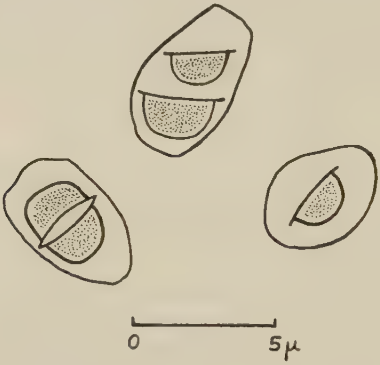


Fig. 1. Ascospores with hat-like configuration observed on Gorodkowa agar. 1—3 spores per ascus. Camera lucida-drawing.

Results of fermentation tests are presented in table II. All 3 cultures fermented glucose, galactose, sucrose, maltose, and raffinose, but not lactose.

TABLE II.

Physiologic properties of the strain isolated by CSILLAG *and* BRANDSTEIN *and controls*

	Assimilation of KNO_3	Assimilation of sugars		Fermentation of sugars				Ability to grow at 37° C.
		Glucose Galactose Sucrose Maltose	Lactose	Glucose Galactose Maltose	Sucrose	Lactose	Raffinose	
Budapest yeast[1] Original culture Subculture A Subculture B	+	+	–	+	+	–	+	+
C. albicans	–	+	–	+	acid, no gas	–	–	+
Saccharomyces carlsbergensis	–	+	–	+	+	–	+	+

[1]) identified by us as *Hansenula anomala* (HANSEN) H. & P. SYDOW.

These 3 cultures all assimilated potassium nitrate. They all utilized glucose, galactose, sucrose, and maltose, but not lactose.

From the results of the above tests, the two subcultures and the original culture are similar in all respects except for the gross characteristics. They all belong to the genus *Hansenula* and the species is *H. anomala* (HANSEN) H. & P. SYDOW. *Hansenula* is in the same tribe with *Saccharomyces*, in the subfamily Saccharomycetoideae of the family Endomycetaceae. Our conclusion was verified by Dr. W. C. SLOOFF from the Centraalbureau voor Schimmelcultures in Delft.

Results on the *Saccharomyces carlsbergensis* and *C. albicans* were all in agreement with the reference textbook (23).

Results in mice injected intravenously with *Hansenula*: when mice were killed from 3 to 26 days after injection, no lesions were found in lungs or any other organs. There was no sign grossly or microscopically of interstitial plasmacellular pneumonia. Cultures from spleen and liver were positive for *Hansenula* up to 21 days. Examination of the lungs with special stains failed to reveal the presence of yeast cells.

The results in suckling mice which 24 hours after birth were exposed to daily intranasal infection with *Hansenula* suspension were as follows: smears made from the lungs were mostly negative. Occasionally phagocytized yeast cells were present. Sections from the lungs of these mice revealed a small number of yeast cells. From 18 days on, few to no organisms were seen in the lungs. In GROCOTT (14) stained slides, yeasts were shown as black walled oval to spherical structures of 3—5 μ.

The pathology ascribed to interstitial pneumonia consists of a peculiar edema fluid-like accumulation of exudate in the alveoli which has a typical honeycomb appearance. From our experience, in spontaneous human cases, ringlike structures of 3—5 μ. can be easily demonstrated in the honeycomb-like exudate with special staining procedures such as the GRIDLEY or GROCOTT stains (13, 14). They are round to oval with occasionally crescent-shaped, collapsed cells (Fig. 2). All these bodies possibly are yeast cells. Such structures, however, were never found in the suckling mice which had inhaled a suspension of *Hansenula*. Of the total 32 exposed mice, seven showed pulmonary pathology with the presence of yeast cells in the area of inflammation. The lesions were found in animals killed at 7, 11, 12, 15, 16, 17 days after inoculation. They were not all uniform in each animal. Some of them consisted of scattered foci of bronchopneumonia with polymorphs predominating. In other cases small purulent almost abscess-like lesions were found and they contained yeast cells. In one case, histocytic nodules were observed which almost resembled tubercles.

We feel that some bacteria found around the nostrils and in the upper respiratory tract itself must have been inhaled during repeated introduction of the *Hansenula* suspension. Therefore the inflammation found in 7 of the 32 mice does not mean that *Hansenula anomala* is pathogenic to mice even if we do not completely deny such a possibility.

Whatever this problem may be, *Hansenula anomala* did not produce in any of the animals a morphologic picture compatible with the lesions observed in human infection of interstitial pneumonia. This refers both to the absence of an exudate and to the completely different appearance of the yeast cells. In human cases of interstitial pneumonia infection, groups of ringlike organisms are found suspended in a honeycomb-like exudate. The findings after aspiration of *Hansenula anomala* consisted of distinct and discrete yeast cells in the pulmonary tissue or in the alveoli. Yeast cells were found as frequently outside the inflammatory foci as within.

Lung smears and sections of the 9 suckling mice which received daily intranasal infection of *C. albicans* were negative for the organism and did not show any sign of disease.

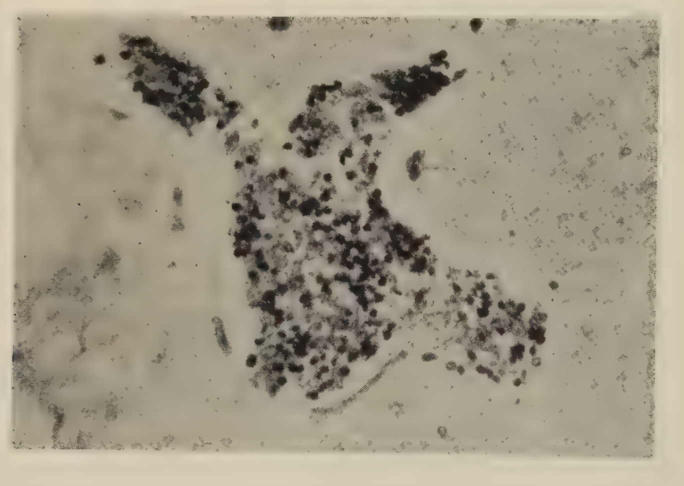


Fig. 2. Human case of Pneumocystis-pneumonia (courtesy Dr. M. Straub Rotterdam, Netherland) with the typical intraalveolar web-like exudate in which organisms can be demonstrated easily with the Grocott silver methenamine stain. Such pictures were never observed in rats infected with *Hansenula anomala*. 500 ×.

Csillag and Brandstein (4,5) reported the yeast they isolated from lungs of premature infants who died of interstitial pneumonia in Budapest to be a *Saccharomyces* sp. which did not assimilate potassium nitrate and had one ascospore or in one case, 8 ascospores per ascus.

Dr. Csillag's culture which was sent to us by Dr. Kovac utilizes potassium nitrate and it has 1—3 ascospores per ascus. This yeast is *Hansenula anomala* (Hansen) H. & P. Sydow.

From the results of our animal experiments "interstitial pneumonia" cannot be induced experimentally in mice with this organism.

Conclusion

The yeast isolated by CSILLAG and BRANDSTEIN from lungs of infants with interstitial pneumonia in Budapest has been identified by us as *Hansenula anomala* (HANSEN) H. & P. SYDOW. Interstitial pneumonia cannot be induced experimentally in mice with this organism. At present there seems to be little conclusive proof that *Hansenula anomala* is the causative agent of the rampant interstitial pneumonia.

Summary

1. The yeast isolated by CSILLAG and BRANDSTEIN (4,5) from lungs of infants with interstitial pneumonia in Budapest has been identified by us as *Hansenula anomala* (HANSEN) H. & P. SYDOW.

2. Our experimental results show that *H. anomala* has 1—3 hat-shaped ascospores per ascus. It assimilates potassium nitrate, glucose, galactose, sucrose, and maltose but not lactose. The yeast ferments glucose, galactose, maltose, sucrose, raffinose but not lactose.

3. Interstitial pneumonia cannot be induced experimentally in young and suckling mice with *H. anomala.*

Bibliography

1. AMMICH, O., 1938. Über die nichtsyphilitische interstitielle Pneumonie des ersten Kindesalters. Virchow's Arch. **302**: 539—554.
2. BAAR, H. S., 1955. Interstitial plasmacellular pneumonia due to Pneumocystis carinii. J. Clin. Path. **8**: 19—24.
3. BENHAM, R. W., 1955. The genus Cryptococcus: The present status and criteria for the identification of species. Trans. N. Y. Acad. Sci. **17**: 418—429.
4. CSILLAG, A., 1957. Contribution to the taxonomical classification of the so-called Pneumocystis carinii. Acta Microbiol. Hungar. **4**: 1—8.
5. CSILLAG, A. & BRANDSTEIN, L. 1954. The role of a Blastomyces species in the genesis of interstitial pneumonia of the premature infant. A preliminary report. Acta Microbiol. Hungar. **1**: 525—529.
6. DAUZIER, G., THAYER, W., & BARNETT, R. N., 1956. Pneumocystis carinii pneumonia in an infant. Amer. J. Clin. Path. **26**: 787—793.
7. DONOHUE, W. L., 1956. Interstitial plasma cell pneumonia. Lab. Invest. **5**: 97—105.
8. FINGERLAND, A. & VORTEL, V., 1954. Zur Kenntnis der Pneumozystis-Pneumonien. Path. Bakt. **17**: 201—220.
9. GAGNE, F. & HOULD, F., 1956. Interstitial plasma cellular (parasitic) pneumonia in infants. Canad. M.A.J. **74**: 620—624.
10. GAJDUSEK, D. C., 1957. Pneumocystis carinii-etiologic agent of plasma cell pneumonia of premature and young infants. Pediatrics **19**: 543—565.
11. GERRARD, J. W. & MOORE, D. F., 1957. Interstitial plasma cellular pneumonia due to Pneumocystis carinii. Canad. M.A.J. **76**: 299—302.
12. GIESE, W., 1953. Pathogenese und Ätiologie der interstitiellen plasmazellularen Säuglingspneumonie. Verh. dtsch. path. Ges. **36**: 284—289.
13. GRIDLEY, M. F., 1953. A stain for fungi in tissue sections. Amer. J. clin. Path. **23**: 303—307.
14. GROCOTT, R. G., 1955. A stain for fungi in tissue sections and smears, using Gomori's methenamine-silver nitrate technic. Amer. J. clin. Path. **25**: 975-979.
15. HAMPERL, H., 1956. Pneumocystis infection and cytomegaly of the lungs in the newborn and adult. Amer. J. Path. **32**: 1—13.

16. Hamperl, H., 1952. Zur Frage des Parasitennachweises bei der interstitiellen plasmocellularen Pneumonie. Klin. Wschr. **30**: 820—822.
17. Hamperl, H., 1957. Über heilende und abortive Pneumocystis-Pneumonie Virchow's Arch. **330**: 325—336.
18. Howard, R. M. & Sheldon, W. H., 1958. Pneumocystis pneumonia. A.M.A. J. Dis. Child. **95**: 18—24.
19. Jírovec, O., 1954. Weitere Beiträge zur Kenntnis der von *Pneumocystis carinii* verursachten interstitiellen Pneumonie der Säuglinge. In Moderne Probleme der Pädiatrie (Suppl. Ann. Paed.) **1**: 85—95.
20. Jírovec, O., 1954. Neues ueber die durch *Pneumocystis carinii* verursachten interstitiellen Pneumonien der Säuglinge. Riv. Paras. **15**: 472—480.
21. Jírovec, O. & Vaněk, J., 1954. Zur Morphologie der *Pneumocystis carinii* und zur Pathogenese der Pneumocystis-Pneumonie. Zbl. allg. Path. path. Anat. **92**: 424—437.
22. Kovac, W. & Kunz, C., 1957. Experimentelle Untersuchungen mit Pilzstämmen aus Frühgeburten-Pneumonien. Zbl. Bakt. **168**: 460—474.
23. Lodder, J. & Kreger-Van Rij, N. W. J.: The Yeasts, a taxonomic study. Interscience Publishers, New York, 1952.
24. McMillan, G. C., 1947. Fatal inclusion — disease pneumonitis in an adult. Amer. J. Path. **23**: 995—1003.
25. Russell, H. T. & Nelson, B. M., 1956. Pneumocystis Pneumonitis in American infants. Amer. J. clin. Path. **26**: 1334—1340.
26. Vaněk, J., 1952. Parasitarní pneumonie z infekce Pneumocystis carinii u 60 lete ženy. (Parasitic pneumonia due to Pneumocystis carinii infection in a woman 60 years old.) Časop. lek. česk. **91**: 1260—1262.
27. Vaněk, J. & Jírovec, O., 1952. Parasitäre Pneumonie: "Interstitielle" Plasmazellenpneumonie der Frühgeborenen, verursacht durch Pneumocystis carinii Zbl. Bakt. **158**: 120—127.
28. Vaněk, J., Jírovec, O. & Lukeš, J., 1953. Interstitial plasma cell pneumonia in infants. Ann. Paediat. **180**: 1—21.

SURVEY OF THE MEDICAL MYCOLOGICAL LITERATURE OF GREAT BRITAIN 1946 to 1956.

by
Jacqueline Walker Ph. D.
(*Mycological Reference Laboratory,
Public Health Laboratory Service,
London School of Hygiene and Tropical Medicine*)

(6.III.1958)

INTRODUCTION

The post-war decade witnessed a striking awakening of interest in the fungus diseases of man and animals in Great Britain. This is attributable, in part, to the outbreaks of tinea capitis which marked the closing period of the war and the years immediately following, but have now completely subsided, and in part to an impressive increase in fungus infections, especially those due to yeast fungi, as a consequence of the widespread use of the broad spectrum antibiotics. Probably, however, the greatest stimulus to interest has been the growing volume of literature on medical mycology, including some valuable textbooks, now available to the medical practitioner.

Grave and fatal types of mycoses are uncommon in Britain, though indigenous cases of cryptococcosis and systemic mould infections are reported from time to time, and although the great endemic mycoses of the New World are not indigenous to Britain they have been encountered in visitors to the country and they have occurred as laboratory infections.

DERMATOPHYTOSES

In the years immediately following the Second World War epidemics of tinea capitis caused by *Microsporum audouini* appeared in various areas in Britain. Among those reported in the literature were outbreaks of 351 cases in Bathgate, West Lothian (1), 631 cases in Dundee and Arbroath (2), and 261 cases in Huddersfield (3). Whittle (4) described an outbreak of infection caused by a culturally dysgonic form of *M. audouini* which responded well to topical treatment, and had a low infectivity rate; during a contact period of 8 months only 13 children in a school of 54 being affected.

A number of surveys extending over periods of years have been conducted. Roberts (5) in a survey of tinea in Portsmouth and its environs showed that scalp ringworm contracted within the City limits was invariably caused by *Microsporum canis*. All other species encountered were traced to sources outside the City.

WALKER (6) in a three years' survey of the country as a whole found that as far as the *Microsporum* species, *M. audouini* and *M. canis* were concerned, there were fairly well defined geographical areas and one or other species predominated in any given area. Among the more interesting species isolated were 42 cases of *Trichophyton schoenleini*. FINN (7) reviewed 100 cases of tinea capitis in Glasgow in which 6 dermatophyte species were identified, but 83 % of the infections were caused by *M. audouini*. CARLIER (8) in an eight year survey of the ringworm flora of Birmingham and the surrounding counties found that an increasing incidence of infections by *M. canis* was coincident with a decrease in *M. audouini* infections; the *M. canis* infections had a largely urban distribution and a seasonal peak in the late winter months. *Trichophyton verrucosum* infections were less common in the area than in the North and South of England, only 7 infections on man having been identified in the 8 years. An epidemiological study of microsporosis in school children in Manchester and the surrounding towns was conducted by CURRY & DANIELS (9). WARREN (10) published a review of tinea capitis and corporis in East London and Essex from 1944 to 1955, including an epidemic due to *M. audouini* in Essex in 1945, but *M. canis* was the principal cause of sporadic infections. WHITTLE (11) surveyed fungus infections in the Cambridge area between 1948 and 1955. In the earlier part of the period isolated foci of infection were found but 3 outbreaks of *M. audouini* occurred. During the second period 1954 to 1955 only sporadic infections were found and these were predominantly animal types. In 1954 WHITTLE (12) published an interesting account of *Microsporum gypseum* infection among men and women employed in a carnation nursery in Herefordshire. Unfortunately the source of the infection has not, as yet, been determined.

Unusual observations included a strain of *M. audouini* which produced large numbers of macroconidia, (HARE (13)); "Fusiform structures" found along the hair shafts in a case of mixed *M. audouini* and *M. canis* infection of the scalp (DANIELS (14)); two cases of non-fluorescent *M. canis* and one of *M. audouini* infection (BEARE & WALKER (15)); a case of *M. canis* infection associated with cicatricial alopecia on the scalp of an adult (ENGLISH & WARIN (16)) and a case of otomycosis caused by *Trichophyton mentagrophytes* (ENGLISH (17)). SHARVILL (18) reported an interesting group of infections in which a 19-year old mother with a *T. sulphureum* infection of her scalp and nails infected her newborn baby. The baby developed facial lesions and in turn infected 3 nurses on the flexor aspect of their left arms where the child's head had rested.

Favus occurs sporadically both as an indigenous and an imported infection. Cases are recorded in the surveys of KINNEAR & ROGERS (2), WALKER (6), FINN (7) and CARLIER (8).

WHITTLE (19) published a report of 3 cases with atypical clinical symptoms in which scutula and broken hairs were absent and neither alopecia nor atrophy occurred. Some interesting observations on the transmission of favus have been made. INMAN (20) showed that it was possible for adult inmates of a mental home to be in contact with a case of favus of the scalp for 17 years without a contact case developing. In the 18th year two outbreaks of favus of the skin occurred and these were attributed to the communal use of a fungicidal ointment, which also caused a spread of the infection on the original case. Epidemiological studies made by CARSLAW (21) on 39 cases in 13 families over a period of 6 years indicated that the disease was transmitted from the mother to the new-born child and not from child to child. If a child escaped infection in infancy it remained relatively immune in later life. In no case was the father of a family infected. HANSELL & PARTRIDGE (22) reported a group of 7 related cases, in which a woman infected her 4 daughters, a baby staying with the family contracted favus and in turn transmitted it to a child at a day nursery. Some of these cases showed clinically atypical lesions of the type described by WHITTLE (19).

Increasing interest has been directed towards the infection of man by zoophilic species. ROOK & FRAIN-BELL (23) gave an account of human infections caused by *Trichophyton verrucosum* (*T. discoides*) and *T. mentagrophytes* in Glamorgan and West Monmouthshire. ROOK (24) described infections by the same species in Cambridgeshire, pointing out that the incidence was highest in the winter. Although the majority of cases of *T. verrucosum* infection have a history of direct contact with infected cattle there is reason to believe that indirect transmission also occurs and the examination of farm installations resulted in the isolation of *T. verrucosum* from a scratching post, the soil at its base and a cowshed wall (WALKER (25)). GENTLES & O'SULLIVAN (26) in an attempt to correlate animal and human ringworm infections examined 163 human cases suspected to be of animal origin. Dermatophytes were isolated from 117 of these; the infecting species being *T. verrucosum* 82, *T. mentagrophytes* 15, *M. canis* 12 and the anthropophylic species *T. sulphureum* 6, *T. rubrum* 1 and *M. audouini* 1. Of the suspected animal sources of these human infections, 78 yielded dermatophytes (*T. verrucosum* 71, *T. mentagrophytes* 1 and *M. canis* 6). In 42 instances the same species was isolated from the patient and the suspected animal source and on 5 occasions a different zoophilic species was isolated from each. Cattle were the main reservoir of infection in this area and not the small domestic pet as in some other areas. Only 7 of the human infections (six *M. canis* and one *T. mentagrophytes*) were traced to small animals.

With the successful treatment of infections caused by anthropophylic species the reservoir of this type of infection has been largely eliminated. However, this is not the case with the increasingly high proportion of human infections by zoophilic species. In Leeds, an area where *M. canis* has always been the predominant type, a campaign was started in 1950 to eliminate, as far as possible, the animal reservoir by segregation, but not wholesale destruction, of the infected cats and dogs (La Touche (27)). In 1955 La Touche (28) reported an overwhelming success of the Leeds campaign due to co-operation of School Medical, Public Health and Hospital authorities. In this paper he presented to the veterinary profession the medical and sociological problems associated with ringworm infections transmitted from lower animals. In a complementary paper Mortimer (29) discussed the animal reservoir of ringworm infections from the veterinary surgeon's point of view. In 1956 the Medical Mycology Committee of the Medical Research Council (30) drew attention to the importance of the animal reservoir of ringworm infection in Britain.

Among infections by fungi of distinctly tropical origin were those described in a survey of Nigeria (Clarke & Walker (83)); a double infection by *T. concentricum* and *T. rubrum* in a European (Sharvill (84)); and an account of tinea imbricata as it occurs in Malaya (Polunin (85)).

Tinea pedis

Tinea pedis has become more common in Britain during the past 10 years and has aroused greater interest, particularly in regard to its transmission among groups of men who, through their occupation, are forced into close proximity. The two main groups to attract attention have been the coal miners and the armed forces. Adamson & Annan (31) examined a group of 555 men at a northern colliery and found that 53 % showed clinical symptoms of tinea pedis. Cultures made from a small number of the cases yielded *Trichophyton mentagrophytes*. Later the Committee for Industrial Epidermophytosis of the Medical Research Council appointed a dermatologist (Dr. J. G. Holmes) and a mycologist (Mr. J. C. Gentles) to investigate the problem in respect to coal miners. They examined 2,101 men from 11 pits, a training centre and 2 power stations, in various parts of the country. 1,900 of the men examined were found to have some abnormality of the skin of the feet but a fungus was isolated in only 438 (21 %), the species isolated being: *T. mentagrophytes* 224; *T. rubrum* 148; *E. floccosum* 11. Double infections were found in 20 cases, *T. mentagrophytes* plus *T. rubrum* in 13; *E. floccosum* plus *T. rubrum* in 4, and *E. floccosum* plus *T. mentagrophytes* in 3. Of the double infections 9 were concurrent and 11 combined. A detailed description of the clinical findings was published (Holmes & Gentles (32)). Epidemiological studies showed that the pit-head bath was the chief factor in the spread of the disease. In one pit the infection rate rose from 3.5 % to 10 % in the six months following the installation of baths. In general 31 % of pit-head bathers were infected against 8 % in non-bathers (Gentles & Holmes (33)).

The establishment of this important fact led to further studies in the isolation of dermatophytes from the floors of communal bathing places. ADAMSON & ANNAN (31) had isolated *T. mentagrophytes* from a skin scale found on the floor of a bath house. GENTLES (34) isolated *T. mentagrophytes* var. *interdigitale* four times and *T. rubrum* once from 5 bath house floors. In order to obtain more exact information GENTLES (35) examined samples from the floors of 4 shower stalls which were wet and "clean" before the stalls were used for the day and a second set of samples 2 hours later after use by 100 or more men. The "clean" samples yielded negative results but 5 out of a total of 8 taken after use yielded *T. mentagrophytes*, the predominant cause of tinea pedis in that particular pit.

The problem of tinea pedis in the armed forces, particularly those in Far Eastern stations, has been the subject of a number of investigations. SLATTERY & WALKER (WALKER (6)) in an examination of the feet of 1010 recruits at the time of intake found 123 showed some questionable symptoms and 30 presented signs clearly suggestive of infection. From 39 of the 1010 (3.8 %) dermatophytes were isolated (*T. mentagrophytes* var. *interdigitale* 29, *T. rubrum* 4, and *E. floccosum* 6). SLOPER & SANDERSON (36) studied the influence of environment on tinea in the British Army in South East Asia, particularly tinea corporis, to ascertain if the commonly found *T. mentagrophytes* was a mutation from *T. interdigitale* which was, at that time, more usually found on troops in Britain. In a further communication (37) they examined the relationship of tinea pedis and tinea corporis and came to the conclusion that tinea corporis was frequently acquired as an extension from a patient's own feet. SLOPER (38) studied experimentally produced human lesions caused by *T. rubrum*, *T. mentagrophytes* and *E. floccosum*. All were self-limiting and healed spontaneously even though one was a zoophilic and two were anthropophilic species. GREENWOOD (39) in a separate investigation of skin disorders in the army in the tropics found *T. mentagrophytes* to be the commonest infecting agent. DAVIES (40) examined 300 soldiers in Britain and found that the incidence of clinical epidermophytosis rose in the first 12 months of service. In a further report (41) he studied 1,050 men grouped into categories according to their length of service and he found a sharp increase in the incidence of clinical symptoms after entering the Army. In this communication he gives advice on treatment and prophylactic measures. BROUGHTON (42) investigated the problem of reinfection among sailors through the agency of socks and shoes. He succeeded in isolating species of dermatophytes from the socks of 35 out of 104 culturally proved cases of tinea pedis; 6 out of 19 suspected cases and 5 out of 100 believed normal controls. *T. mentagrophytes* var. *interdigitale* was readily recovered from laundered socks of the infected patients.

During the post-war years there has been an increasing incidence of infection by *Trichophyton rubrum* in all parts of Britain and investigations into the transmission of this type of infection have been carried out. ENGLISH (43) examined the home contacts of 19 infected patients. In 9 of the 19 families concerned the disease had spread and 13 (27 %) of the 48 contacts were infected. Six out of 8 people over the age of 14 who had been exposed to the infection in childhood contracted the disease. Periods of exposure before clinical symptoms developed varied from 1 to 15 years. An analysis of the patients and their contacts showed that the disease commenced on the feet in 27, on the hands in 4 and on the face in 1. The nails were involved in 78 %. INGRAM & LA TOUCHE (44) traced the contacts of 352 patients with tinea pedis and found the disease had spread within the family on 5 occasions in the case of *T. rubrum* infections, twice with *T. interdigitale* and twice when the infecting agent was *E. floccosum*. Other reports on *T. rubrum* infections included an account of a generalized skin and nail infection (MACKENNA & CALNAN (45)) and a report on 3 cases of tinea cruris in women (ENGLISH et al (46)). CRUICKSHANK (47) discussed the epidemiology of tinea capitis and tinea pedis in a paper on skin diseases as a whole.

Papers on general clinical features of tinea pedis, its diagnosis and treatment, have been published by DUNCAN (48), GRANT PETERKIN (49), DOWLING (50), ROSENSTEIN (51), CALNAN (52), MITCHELL-HEGGS (53), MUENDE (54), HELLIER (55). A method of home treatment was given by GOULD et al (56) and treatment according to the site of the lesion by HELLIER (57). Treatment of body ringworm in the tropics was suggested by BYRNE (58) and GREENWOOD (59). Methods for the prevention and treatment of tinea pedis were given by GRAY (60) and with special reference to the tropics by JOLLY (61).

Various views on the treatment of tinea capitis have been expressed. The values of fungicidal ointments are discussed by BRAIN et al (62), HABER et al (63).

The treatment of various types of tinea capitis by X-ray therapy without the subsequent use of fungicidal ointments has been used successfully by LYDON et al (64) on 103 cases and by CARSLAW (65) on 208 cases.

THOMAS (66) pointed out that children infected with *M. audouini* receive X-ray therapy and are frequently able to resume school sooner than those infected with *M. canis* who receive topical treatment. As *M. canis* is less contagious among children, THOMAS allowed 24 infected children each wearing a closely fitting linen cap to continue their attendance at 19 schools. In no instance was there a dissemination of infection and the conclusion is reached that absence from school is unnecessary during treatment of children infected with *M. canis*.

EVERALL (67) indicated social difficulties which would arise from the practice of THOMAS' suggestion and showed how the incidence of *M. canis* infections in Leeds has been reduced, by the control of the infected animal sources, from 85 cases in 1950 to 46 in 1951, 27 in 1952 and only 3 in 1953.

The constant search for suitable fungicides capable of penetrating the keratin barrier of the epidermis and hair has led to a number of important studies being carried out on the chemistry and metabolism of the dermatophytes.

The digestion of human hair keratin by *Microsporum canis* in vitro was observed by DANIELS (68) and the resulting amino acids were analysed by chromatographic methods, and shown to be present in similar proportions to those obtained by the acid hydrolysis of human hair. HARE (69) made quantitive estimations of the amino acid contents of 7 species of dermatophytes (*Microsporum audouini, M. canis, Trichophyton mentagrophytes, T. verrucosum, T. violaceum, T. rubrum* and *Epidermophyton floccosum*) and found a close approximation to the amino acid contents of a number of saprophytic fungi. He concluded that other factors were involved in the growth of the dermatophytes in keratin.

BENTLEY (70) studied amino acid oxidase and asparaginase activity in *M. canis, M. gypseum, T. rubrum* and *T. mentagrophytes* and CHATTAWAY et al (71) studied the enzymatic activities of *M. canis.*

In studies on the metabolism of *M. audouini* and *M. canis* BARLOW et al (72) found that endogenous respiration was inhibited by fluoride, arsenite, iodoacetate and cyanide. In further observations on the fungistatic and fungicidal action of fatty acids and various detergents on *M. audouini, M. canis, T. schoenleini, T. rubrum,* and *E. floccosum,* CHATTAWAY et al (73) made quantitive studies on the effect on these substances on endogenous respiration under different conditions and they also examined the cell constituents released from washed mycelium in the presence of these materials. The endogenous respiration was inhibited by arsenite, fluoride, iodoacetate, fluoroacetate, and saturated straight chain fatty acids, the effect increasing with the length of the carbon chain. Cationic, anionic and neutral detergents were also inhibitory. BARLOW et al (74) studied the mode of attack on chemically treated keratin by *M. canis, M. audouini, T. rubrum* and *E. floccosum* and the modifications which occur in this attack when the cross linkages between the keratin molecules are broken or increased. All 4 fungi showed a much more marked and rapid attack when grown on keratin which had been modified by breaking the naturally occurring cross-linkages between keratin molecules. Conversely the attack was significantly less when the fungi were grown on keratin treated in order to increase cross-linkages on the side chains.

In order to test the practical value of these findings, BARLOW et al (75) selected and treated 5 patients with resistant *T. rubrum* infections of the nails and the corresponding soles; treatment was confined to one foot. For keratin degrading agents urea was used to break the hydrogen bonds and sodium metabisulphite to break the disulphide bridges. As a cross-linking agent between keratin molecules ninhydrin was used. The patient's foot was first soaked in a solution of the degrading agents for 6 hours, after which the foot was sprayed with ninhydrin and phenyl mercuric nitrate. The treatment was repeated. At the end of 6 weeks considerable clinical improvement had taken place but cure had not been effected, due to the fact that the penetration of the fungicide was inadequate.

The fluorescent materials produced in vivo by *M. canis*, *M. audouini* and *T. schoenleini* were extracted with dilute ammonia by Chattaway et al (76) and examined by paper chromatography and electrophoresis and it was shown that the principal fluorescent material was common to all but additional fluorescent substances were present in infections caused by *T. schoenleini*. The chemical properties and absorption spectra of the extracts were also examined.

Cruickshank et al (77) examined culture filtrates of *T. rubrum* and *T. mentagrophytes* for extra-cellular enzymes and toxins, and showed that the filtrates have proteolytic properties and that the enzyme or enzymes responsible are elaborated at an early stage in the growth of the fungus. The filtrates separated the epidermis from the dermis when incubated in vitro, and dissolved the attachments of the prickle cell layer. The strains were found to vary in their capacity to produce this proteolytic enzyme but in general *T. rubrum* produced very much less than *T. mentagrophytes*. It was considered that the production of an enzyme or enzymes which would loosen the epidermal attachments explained the vesiculation and sealing associated with fungal infections. Further studies on the exact nature of the enzymes concerned are being carried out (Personal communication 1958).

Dermatophyte cultural observations

From an exhaustive study of the literature together with personal observations Stockdale (78) made a compilation of the nutritional requirements of the dermatophytes; particular attention was paid to temperature, humidity of medium, pH, carbon and nitrogen utilization, the value of amino acids and the gaseous requirements for vegetation. In a second study Stockdale (79) made observations on the similar requirements of *Trichophyton persicolor*.

Studies on factors influencing the growth of dysgonic strains of *Microsporum canis* were made by Johnstone & La Touche (80), and English & Barnard (81) examined the effect of trace metal deficiencies on two strains of *T. mentagrophytes* and two strains of *T. rubrum*. Walker (82) studied variation in primary isolates of *Microsporum audouini* and *M. canis*.

References

1. Keddie, J. A. G. (1947) Ringworm of the Scalp in Children. Its causation, detection and treatment and a report of an outbreak. Hlth. Bull. Scotl. **5**, 66—68.

2. Kinnear, J. & Rogers, J. (1948) Ringworm of the Scalp in the Eastern Region of Scotland 1946—1947. Brit. med. J. **i**, 854—858.
3. Barlow, A. J. E., Chattaway, F. W. & Whewell, C. S. (1950) Ringworm of the scalp due to Microsporum audouini. Brit. J. Derm. **62**, 251—261.
4. Whittle, C. H. (1953) Is scalp ringworm in children a self-limiting disease? An epidemic of unusually mild form produced by M. audouini, dysgonic type. Lancet **265**, 10—12.
5. Roberts, T. E. (1947) The varieties of fungi causing ringworm of the scalp. Med. Offr. **77**, 65.
6. Walker, J. (1950) The Dermatophytoses of Great Britain. Report of a three years' survey. Brit. J. Derm. **62**, 239—251.
7. Finn, O. A. (1951) A review of 100 cases of ringworm of the scalp. Glasgow med. J. **32**, 13—15.
8. Carlier, G. I. M. (1954) An eight-year survey of the ringworm flora of Birmingham. J. Hyg. Camb. **52**, 264—271.
9. Curry, J. & Daniels, G. (1955) Ringworm of the scalp in school children in the Manchester Hospital Region. Med. Offr. **93**, 165—171.
10. Warren, C. M. (1956) Tinea capitis in East London & Essex 1944—1955. Brit. J. Derm. **68**, 264—267.
11. Whittle, C. H. (1956) A survey of fungous infection in the Cambridge area 1948—1955. Brit. J. Derm. **68**, 1—10.
12. Whittle, C. H. (1954) A small epidemic of Microsporum gypseum ringworm in a plant nursery. Brit. J. Derm. **66**, 353 —356.
13. Hare, P. J. (1952) A strain of Microsporum audouini producing numerous macroconidia on culture. Brit. J. Derm. **64**, 236—242.
14. Daniels, G. (1953) Structures resembling fuseaux in a case of ringworm of the scalp due to M. canis Bodin and M. audouini Gruby. Brit. J. Derm. **65**, 95—98.
15. Beare, M. J. & Walker, J. (1955) Non-fluorescent Microsporum audouini and M. canis infections of the scalp. Brit. J. Derm. **67**, 101—104.
16. English, M. P. & Warin, R. P. (1955) Microsporum canis infection of the scalp in an adult with cicatricial alopecia. Brit. J. Derm. **67**, 196—197.
17. English, M. P. (1957) Otomycosis caused by a ringworm fungus. J. Laryngol. **71**, 207—208.
18. Sharvill, D. (1955) Trichophyton sulphureum ringworm infections in an adult scalp, a new-born infant and three nurses. Brit. med. J. **ii**, 415—417.
19. Whittle, C. H. (1947) Atypical favus. Brit. J. Derm. **59**, 199.
20. Inman, P. (1954) Favus of the scalp with unusual epidemiological features. Brit. J. Derm. **66**, 409—410.
21. Carslaw, R. W. (1955) Favus of the scalp. Observations on the manner of spread. Brit. J. Derm. **67**, 392.
22. Hansell, J. & Partridge, B. M. (1955) Favus; a report of seven related cases. Brit. med. J. **i**, 1510—1511.
23. Rook, A. J. & Frain-Bell, W. (1954) Cattle ringworm. Brit. med. J. **ii**, 1198—1200.
24. Rook, A. J. (1956) Animal ringworm. Trichophyton discoides and T. mentagrophytes in the Cambridge area. Brit. J. Derm. **68**, 11—15.
25. Walker, J. (1955) Possible infection of man by indirect transmission of Trichophyton discoides. Brit. med. J. **ii**, 1430—1431.
26. Gentles, J. C. & O'Sullivan, J. G. (1957) Correlation of human and animal ringworm in West of Scotland. Brit. med. J. **ii**, 678.
27. La Touche, C. J. (1952) The Leeds campaign against Microsporosis in children and domestic animals. Vet. Rec. **64**, 398—399.
28. La Touche, C. J. (1955) The importance of the animal reservoir of infections in the epidemiology of animal type ringworm in man. Vet. Rec. **67**, 666—667.
29. Mortimer, P. H. (1955) Man, Animals and Ringworm. Vet. Rec. **67**, 670—672.
30. Med. Myc. C'tee. of Med. Res. Council (1956) Animal reservoir of ringworm infection in Britain. Brit. med. J. **i**, 963—965.
31. Adamson, J. B. & Gillies Annan, W. (1949) Epidermophytosis. Preventive measures at pit head baths. Brit. J. phys. Med. **12**, 34—37.

32. Holmes, J. G. & Gentles, J. C. (1956) Diagnosis of foot ringworm. Lancet **271**, 62—63.
33. Gentles, J. C. & Holmes, J. G. (1957) Foot ringworm in coal miners. Brit. J. indust. Med. **14**, 22—29.
34. Gentles, J. C. (1956) Isolation of dermatophytes from the floors of communal bathing places. J. Clin. Path. **9**, 374—377.
35. Gentles, J. C. (1957) Athlete's foot fungi on floors of communal bathing places. Brit. med. J. **i**, 746—748.
36. Sanderson, P. H. & Sloper, J. C. (1953) Skin disease in the British Army in S. E. Asia. (1) Influence of environment on skin disease. (2) Tinea corporis: clinical and pathological aspects, with particular reference to the relationship between T. interdigitale and T. mentagrophytes. Brit. J. Derm. **65**, 252—264 and 300—309.
37. Sanderson, P. H. & Sloper, J. C. (1953) Skin disease in the British Army in S. E. Asia. (3) The relationship between mycotic infections of the body and of the feet. Brit. J. Derm. **65**, 362—372.
38. Sloper, J. C. (1955) A study of experimental human infections due to T. rubrum, T. mentagrophytes and E. floccosum with particular reference to the self-limitation of the resultant lesions. J. invest. Derm. **25**, 21—28.
39. Greenwood, K. (1949) Common skin disorders of the Army in the tropics. J. Roy Army Med. Cps. **92**, 284—289.
40. Davies, A. J. (1951) Preliminary communication on the incidence of epidermophytosis in Army recruits. J. Roy Army Med. Cps. **97**, 168—171.
41. Davies, A. J. (1952) Report on the incidence of epidermophytosis of feet in 1050 Army personnel and a comparison of different lines of treatment. J. Roy Army Med. Cps. **98**, 99—106
42. Broughton, R. H. (1955) Reinfection from socks and shoes in tinea pedis. Brit. J. Derm. **67**, 249—254.
43. English, M. P. (1957) Trichophyton rubrum infection in families. Brit. med. J. **i**, 744—746
44. Ingram, J. T. & La Touche, C. J. (1957) Athletes foot. Brit. med. J. **i**, 886.
45. MacKenna, R. M. B. and Calnan, C. D. (1954) Trichophyton rubrum infection. An account of a case in an 18-year girl. Brit. J. Derm. **66**, 411—412.
46. English, M. P. & La Touche, C. J. (1957) Tinea cruris in women - a report of three cases. Brit. J. Derm. **69**, 311.
47. Cruickshank, R. (1953) The epidemiology of some skin infections. Brit. med. J. **i**, 55—59.
48. Duncan, J. T. (1946) Tinea pedis (Athlete's foot). Mon. Bull. Minist. Hlth. **5**, 76—80.
49. Grant Peterkin, G. A. (1947) Common skin infections of the feet. Chiropodist **ii**, 98—100.
50. Dowling, G. B. (1949) Athlete's foot. Trans. med. Soc. Lond. **65**, 262—267.
51. Rosenstein, H. (1950) Survey of treatment of fungal infections. Chem. Products **13**, 374—377.
52. Calnan, C. D. (1956) Tinea pedis. Med. World. Lond **84**, 117—119.
53. Mitchell-Heggs, G. B. (1949) The treatment of athlete's foot. Practitioner **163**, 123—129.
54. Muende, I. (1948) Treatment of fungus diseases of the skin. Trans. R. Soc. trop. Med. Hyg. **42**, 216.
55. Hellier, E. (1948) Advances in dermatology. Practitioner **166**, 291.
56. Gould, W. & Schwartz, M. (1956) Tinea pedis in general practice. Practitioner **176**, 670—673.
57. Hellier, F. F. (1947) The treatment of ringworm. Practitioner **158**, 253.
58. Byrne, E. A. (1947) Effect of organic mercurial preparations on diseases of the skin. Brit. med. J. **i**, 90—92.
59. Greenwood, K. (1951) The treatment of tinea in Malaya. J. Roy Army Med. Cps. **97**, 157—164.
60. Gray, A. (1946) The prevention and treatment of tinea pedis. Mon. Bull. Minist. Hlth. **5**, 100—104.
61. Jolly, H. R. (1948) Prevention of ringworm in the tropics. Brit. med. J. **i**, 726.

62. Brain, R. T., Crow, K., Haber, H., McKenny, C., & Hadgraft, J. W. (1948) Treatment of ringworm of the scalp. Brit. med. J. **i,** 723.
63. Haber, H., Brain, R. T., & Hadgraft, J. W. (1949) Treatment of ringworm of the scalp. Brit. med. J. **ii,** 626—627.
64. Lydon, F. L., Stephanides, T., & Robb, T. M. (1949) Ringworm of the scalp. Treatment by X-Ray epilation without subsequent local application. Brit. med. J. **i,** 523—524.
65. Carslaw, R. W. (1951) The treatment of tinea capitis without fungicides. Brit. J. Derm. **63,** 16—20.
66. Thomas, B. A. (1953) M. canis ringworm and loss of schooling. Brit. med. J. **i,** 536—539.
67. Everall, J. (1954) Local treatment of tinea capitis and the problem of school attendance. Med. Offr. **92,** 29—30.
68. Daniels, G. (1953) The digestion of human hair keratin by Microsporum canis Bodin. J. Gen. Microbiol. **8,** 289—294.
69. Hare, P. J. (1953) Amino-acid composition of Eight Dermatophyte Fungi. Lancet **265,** 1238—1239.
70. Bentley, M. L. (1953) Enzymes of pathogenic fungi. J. gen. Microbiol. **8,** 365—377.
71. Chattaway, F. W., Thompson, C. C., & Barlow, A. J. E. (1954) Enzymes of Microsporum canis. Biochim. Biophys. Acta **14,** 583—584.
72. Barlow, A. J. E., Chattaway, F. W., & Thompson, C. C. (1953). Effect of inhibitors on the metabolism of Microsporum. Biochem. J. **55,** 31,.
73. Chattaway, F. W., Thompson, C. C., & Barlow, A. J. E. (1956) The action of inhibitors on dermatophytes. Biochem. J. **63,** 648—656.
74. Barlow, A. J. E., & Chattaway, F. W. (1955) The attack of chemically modified keratin by certain dermatophytes. J. invest. Derm. **24,** 65—74.
75. Barlow, A. J. E., & Chattaway, F. W. (1955) Persistent fungus infections of skin, hair and nails. Lancet **269,** 1269—1271.
76. Chattaway, F. W., & Barlow, A. J. E. (1954) The fluorescent materials produced in vivo by certain dermatophytes. J. gen. Microbiol. **11,** 506—511.
77. Cruickshank, C. N. D., & Trotter, M. D. (1956) Separation of epidermis from dermis by filtrates of Trichophyton mentagrophytes. Nature, Lond. **177,** 1085—1086.
78. Stockdale, P. M. (1953) Nutritional requirement of the dermatophytes. Biol. Rev. **28,** 84—104.
79. Stockdale, P. M. (1953) Requirements for the growth and sporulation of Trichophyton persicolor. J. gen. Microbiol. **8,** 434—441.
80. Johnstone, K. I., & La touche, C. J. (1956) Cultural characteristics of dysgonic strains of Microsporum canis Bodin. Trans. Brit. mycol. Soc. **39,** 442—448.
81. English, M. P. & Barnard, N. H. (1955) The effect of trace metal deficiency on some Trichophyton strains. Trans. Brit. mycol. Soc. **38,** 78—82.
82. Walker, J. (1950) Variation in Microsporum canis and Microsporum audouini. Brit. J. Derm. **62,** 395—401.
83. Clarke, G. H. V. & Walker, J. (1953) Superficial Fungus Infections in Nigeria. J. trop. Med. Hyg. **56,** 117—121.
84. Sharvill, D. (1952) Tinea imbricata in a European; double infection with T. concentricum and T. rubrum. Brit. J. Derm. **64,** 373—377.
85. Polunin, I. (1952) Tinea imbricata in Malaya. Brit. J. Derm. **64,** 378—384.

Candidiasis

The introduction of broad spectrum antibiotic therapy has, as in other countries, led to an increase in the number of cases of candidiasis occurring as a secondary infection and the incidence in Britain is much higher than the published records indicate.

Cases following antibiotic therapy include one of candidiasis of the oropharynx spreading to the bronchi which developed in a patient with maxillary sinusitis (Ormerod et al (1)); acute candidiasis of the urinary tract following treatment for an acute febrile illness (Taylor & Rundle (2)); apparent candida pneumonia which developed in a patient with bilateral lung lesions and a pleural effusion (Wolff (3)). Two cases of candidiasis followed perforated duodenal ulcer and antibiotic treatment. The first (Reynell et al (4)) developed a fibrinopurulent peritonitis with fatal results. A partial gastrectomy was performed on the second (Caplan (5)) but bronchopneumonia developed and was treated with antibiotics; later cerebral embolism occurred and was followed by multiple embolism. At necropsy mycelium was found in the mitral valve and in the iliac arteries. Two other, but not fatal, cases of pulmonary infection following antibiotic therapy were recorded by Bass et al (6) and Browne (7).

The effect of antibiotics was investigated by Tomaszewski (8) who examined 126 patients after a course of chloramphenicol and aureomycin. Tongue scrapings showed a rapid replacement of the bacterial by a fungal flora consisting largely of *Candida albicans*. In some cases gastro-intestinal symptoms occurred with nausea and diarrhoea, and in some irritation of the mucosal surfaces. Sharp (9) conducted an investigation on 174 male patients with pneumonia. On admission the men were allocated alternately to one of two groups. One group of patients was treated with oxytetracycline (terramycin) and the other with sulphadiazine. Before, during and after treatment, rectal and throat swabs and sputum were examined. Patients receiving sulphadiazine therapy showed no increase in *C. albicans* during treatment but a small rise occurred 2 to 4 days after treatment ceased. Patients receiving oxytetracycline showed increases of 26% in throat swabs, 29% in sputa and 59% in rectal swabs during treatment. The presence of *C. albicans* was not associated with clinical symptoms. Among cases of primary candidiasis were some of infantile thrush. Bound (10) found the incidence of thrush diaper rash in infants to be about 3% in the first six months of life and aetiologically the condition appeared to be more closely associated with vaginal thrush in the mother than oral thrush in the infant.

Wolff et al (11) reported three cases in new-born infants of thrush oesophagitis accompanied by inco-ordination in swallowing leading to aspiration pneumonia. In all three, treatment with hydroxystilbamidine was effective. Lederer & Todd (12) in a series of 204 necropsies on infants less than one year old found evidence of either pharyngeal or oesophageal thrush in 26 infants, 2 cases of apparent mycotic empyema and 2 cases with mycotic miliary abscesses in the kidney and lung. Ulceration of the gastric and intestinal mucosae and infection of the middle ear and mastoid also occurred. Severe thrush was more common in bottle-fed than in breast-fed infants.

Other interesting observations included a case of chronic idiopathic hypoparathyroidism associated with candidiasis in an 11-year old child (McLean (13)) and a case of nodular candidiasis of the tongue; the diagnosis being confirmed by biopsy and culture (Bowers & Whimster (14)).

An account of vulvo-vaginal candidiasis was given by Dawkins et al (15) and a case of intestinal thrush was described by Beemer et al (16). Oliver (17), from a study of 50 cases, came to the conclusion that 'Monilia' might be the cause of asthma.

The difficulty of diagnosing pulmonary candidiasis has always aroused interest and to illustrate this point Robertson (18) used a case of chronic pulmonary disease in which *C. albicans* had frequently been isolated from the sputum but at necropsy no evidence of candidiasis was found, the diagnosis being "bronchiectasis with amyloid disease". Brown (19) reviewed the history of pulmonary mycosis and gave notes on 8 of his own cases. Armstrong & Hall (20) examined the incidence of *Candida* spp. in 307 routine specimens from chest clinics and sanatoria.

General advice on diagnosis and treatment of candidiasis was published by Warren (21) and Wallace (22). Jennison (23) made a comparative study of the therapeutic value of nystatin and gentian violet in the treatment of 71 cases of candida vaginitis in pregnant and non-pregnant women and confirmed the superior value of nystatin. In both groups the failures were mainly in the pregnant women.

Most of the serological studies on *Candida* in Britain in recent years have been carried out by Winner. In an earlier paper Evans & Winner (24) studied the histogenesis of the lesions produced in experimental infections in rabbits. Two types of lesion were observed, it was found that the glomerular lesions were without parallel elsewhere in the body but the extra-glomerular suppurative lesions were similar to those in other organs and tissues.

Candida agglutinins are known to occur in the sera of presumed normal persons. Winner (25) examined 2017 Wasserman sera by slide agglutination against a suspension of *C. albicans*, and obtained 638 positives. Quantitative agglutination tests were performed on 501 sera, 121 from persons known to be infected and 380 presumed uninfected controls. The results showed that infection was not always associated with a significantly high titre of agglutination and conversely a relatively high titre of agglutinaton might be found in persons who could be presumed free of infection. Serial agglutination tests on infected persons gave no significant variation in titre over considerable periods.

Winner (26) investigated the relation between possession of antibodies and resistance to infection in experimental candidiasis in rabbits and found that this animal had a considerable natural immunity to *C. albicans*. However, naturally and experimentally immunized animals did not survive any longer than non-immunized animals injected with the same number of organisms. WINNER believed that *C. albicans* possessed a mechanism unaffected by specific agglutinins. HENRICI (27) believed that an endotoxin was produced and WINNER'S experiments support the view that *C. albicans* produces a toxin unaffected by the agglutinins.

References

1. ORMEROD, F. C. & FRIEDMANN, I. (1951) A case of Moniliasis. Brit. med. J. **ii,** 1439.
2. TAYLOR, H. & RUNDLE, J. A. (1952) Acute moniliasis of the urinary tract. Lancet **262,** 1236.
3. WOLFF, F. W. (1952) Moniliasis pneumonia following aureomycin therapy. Lancet **262,** 1236—1238.
4. REYNELL, P. C., MARTIN, E. A. & BEARD, A. W. (1953) Monilia peritonitis. Brit. med. J. **i,** 919.
5. CAPLAN, H. (1955) Monilial (candida) endocarditis following treatment with antibiotics. Lancet **269,** 957—958.
6. BASS, B. H., MAC FARLANE, R. G. & PHILLIPS, T. (1954) Bilateral haemorrhagic effusion complicating acute pulmonary moniliasis. Lancet **266,** 709—710.
7. BROWNE, S. G. (1954) Moniliasis following antibiotic therapy. Lancet **266,** 393—395.
8. TOMASZEWSKI, T. (1951) Side-effects of chloramphenicol and aureomycin, with special reference to oral lesions. Brit. med. J. **i,** 388—392.
9. SHARP, J. L. (1954) The Growth of Candida albicans during antibiotic therapy. Lancet **266,** 390—392.
10. BOUND, J. P. (1956) Thrush napkin rashes. Brit. med. J. **i,** 782—784.
11. WOLFF, O. H., PETTY, B. W., ASTLEY, R. & SMELLIE, J. M. (1955) Thrush oesophagitis with pharyngeal inco-ordination treated with Hydroxystilbamidine. Lancet **268,** 991—994.
12. LEDERER, H. & TODD, R. McL. (1949) Thrush in Infancy. Arch. Dis. Childh. **24,** 200—207.
13. McLEAN, M. M. (1954) Chronic idiopathic hypoparathyroidism associated with moniliasis. Arch. Dis. Childh. **29,** 419—421.
14. BOWERS, R. & WHIMSTER, I. W. (1954) Case for diagnosis: nodular moniliasis of tongue. Proc. Roy. Soc. Med. **47,** 653—654.
15. DAWKINS, S. M., EDWARDS, J. M. B. & RIDDELL, R. W. (1955) Fungal infection of the female genital tract. Med. Ill. **9,** 767—772.
16. BEEMER, A. M., PRYCE, D. M. & RIDDELL, R. W. (1954) Candida albicans infection of the gut. J. Path. Bact. **68,** 359—366.
17. OLIVER, H. G. (1952) Asthma due to an infection: a clinical study. Med. Offr. **87,** 149—150.
18. ROBERTSON, R. F. (1948) Pulmonary moniliasis. Edin. med. J. **55,** 274—281.
19. BROWN, T. G. (1947) Pulmonary mycosis. Edin. med. J. **54,** 414—420.
20. ARMSTRONG, E. C. & HALL, J. A. (1956) The incidence of Candida species in routine specimens of sputum. Mon. Bull. Min. Hlth. Lab. Serv. **15,** 220—224.
21. WARREN, CLARA M. (1952) Moniliasis. Med. Pr. **00,** 59—61.
22. WALLACE, H. J. (1955) Cutaneous Moniliasis. Practitioner **174,** 343—345.
23. JENNISON, R. F. & LLYWELYN-JONES, J. D. (1957) Treatment of Monilial Vaginitis. A clinical trial of Nystatin. Brit. med. J. **i,** 145—146.
24. EVANS, W. E. D. & WINNER, H. I. (1954) The Histogenesis of the Lesions in Experimental Moniliasis in Rabbits. J. Path. Bact. **67,** 531—535.
25. WINNER, H. I. (1955) A study of Candida albicans agglutinins in human sera. J. Hyg. **53,** 509—512.
26. WINNER, H. I. (1956) Immunity in Experimental Moniliasis. J. Path. Bact. **71,** 234—237.
27. HENRICI, A. T. (1940) Characteristics of Fungous Diseases. J. Bact. **39,** 113.

CRYPTOCOCCOSIS

Cryptococcosis is endemic in Britain and is commoner than the published records indicate. Although presumably the initial infection is generally pulmonary, the commonest form of the disease diagnosed was a meningitis, meningo-encephalitis (MAGAREY & DENTON (1), DANIEL et al (2), CALDWELL & RAPHAEL (3)) or a "toruloma" in the brain, DANIEL et al (2).

A cryptococcal tumour in the lung, or "toruloma", was reported in two patients; a woman on whom pneumonectomy failed to effect a cure (CRUICKSHANK et al (4)) and a man in whom the disease was eradicated by basal pulmonary resection (BECK et al (5)).

An association of cryptococcosis with Hodgkin's disease has been clearly established. In this connection a case described by BECK et al (5) is of interest: 3 years after a diagnosis of Hodgkin's disease was made, symptoms of intracranial involvement supervened and death occurred. Necropsy revealed a condition of cryptococcal meningitis with related foci in the cerebral cortex. Lesions in other parts of the body were those of Hodgkin's. Although cryptococci were not found in the lymphogranulomatous lesions the authors suspected this to be a case of cryptococcosis simulating Hodgkin's disease. MISCH (6) described a case of cryptococcosis superimposed on a pre-existing lymphadenopathy in which the cryptococcal lesions were confined to the granulomatous lymph nodes of the right groin. No cryptococci were found in other organs or those affected by Hodgkin's disease. No abnormalities were found in the brain, spinal cord or lungs. (Hodgkin's lesions were present in liver, spleen and para-aortic glands). LEVENE & MICHAELS (7) reported a case of disseminated cryptococcosis in a patient with advanced Hodgkin's disease. *Cryptococcus neoformans* was isolated from the blood and ascitic fluid before death. No neurological symptoms were apparent though at necropsy an early meningitis was observed histologically. The disseminated infection was heaviest in the lungs and ascitic fluid but groups of cryptoccoci were found in the pancreas, kidneys, thyroid, spleen and some abdominal lymph nodes, adrenals and the brain. The authors suspected that the unusual form of an overwhelming acute infection may have been due to heavy antibiotic therapy for the last 3 months of life.

A case of disseminated cryptococcosis simulating Hodgkin's disease and rodent ulcer was described by SYMMERS (8). The case, initially diagnosed as Hodgkin's disease, later showed symptoms suggestive of pulmonary tuberculosis and then developed apparent rodent ulcers on the face. A biopsy of the ulcers revealed the true nature of the disease. *C. neoformans* was isolated from the ulcers, sputum and urine. Patient made a transient recovery but died of cerebral haemorrhage. Hodgkinoid type tissue occupied much of the lungs and also occurred in the liver, lymph nodes and kidneys. Cryptococci were found in these lesions but were not numerous.

Symmers (8) reported a previously undescribed form of cryptococcosis, in which true suppurative lesions containing large numbers of cryptococci, and resulting from an acute terminal dissemination of the infection, were found in the spleen, lymph nodes, and liver in a case of generalized granulomatous disease affecting the lungs, pleura, liver, spleen and splenic nodes. Abscess-like pulmonary lesions seen radiologically were found to be caseous granulomata containing cryptococci.

The occurrence of sarcoidosis in identical twins, one of which developed cryptococcosis, was reported by Plummer et al (9). The patient developed osteitis of the scapula and *C. neoformans* was isolated from a subcutaneous pseudo-abscess which formed over the bone. The osteitis resolved but eventually meningitic symptoms supervened and the patient died of cryptococcal meningitis.

Pathogenic cryptococci have been isolated from various other sources; Carter & Young (10) isolated *C. neoformans* from a pooled milk sample during routine examination of milk for tubercle bacilli.

Spontaneous infections occurred in animals. Skulski & Symmers (11) reported a spontaneous infection in a pet ferret, and in 1948 a natural infection was found in a white mouse at the London School of Hygiene and Tropical Medicine.

References

1. Magarey, F. R. & Denton, P. H. (1948) Torula histolytica infection of central nervous system. Brit. med. J. **i,** 1082—1083.
2. Daniel, P. M., Schiller, F. & Vollum, R. L. (1949) Torulosis of the central nervous system. Report of 2 cases. Lancet **256,** 53—56.
3. Caldwell, D. C. & Raphael, S. S. (1955) A case of cryptococcal meningitis. J. clin. Path. **8,** 32—37.
4. Cruickshank, D. B. & Harrison, G. K. (1952) A case of pulmonary cryptococcosis. Thorax **7,** 182—184.
5. Beck, A., Hutchings, M. W., Makey, A. R., & Tuck, I. M. (1955) Infection with Cryptococcus neoformans in man. Report of 2 cases. Lancet **268,** 535—538.
6. Misch, K. A. (1955) Torulosis associated with Hodgkin's Disease. J. clin. Path. **8,** 207—210.
7. Levene, M. & Michaels, L. (1955) Acute disseminated torulosis associated with Hodgkin's disease. J. clin. Path. **8,** 201—206.
8. Symmers, W. St. C. (1953) Torulosis. A case mimicking Hodgkin's disease and rodent ulcer and a presumed case of pulmonary torulosis with acute dissemination. Lancet **265,** 1068—1074.
9. Plummer, N. S., Symmers, W. St. C. & Winner, H. I. (1957) Sarcoidosis in Identical Twins with torulosis as a complication in one case. Brit. med. J. **ii,** 599—603.
10. Carter, H. S. & Young, J. L. (1950) Note on the isolation of Cryptococcus neoformans from a sample of milk. J. Path. Bact. **62,** 271—273.
11. Skulski, G. & Symmers, W. St. C. (1954) Actinomycosis and Torulosis in the Ferret (Mustela furo L.) J. comp. Path. **64,** 306—311.

ASPERGILLOSIS

Aspergillosis occurs in Britain with much greater frequency than is indicated by the published reports. It occurs both as primary and as secondary infections.

Interest has been aroused concerning the possible connection between gastric ulcer and primary aspergillosis, and two interesting cases are reported. Ross (1) described a case of primary pulmonary aspergillosis in a 50-year old male who suffered from gastric carcinoma following a gastric ulcer. At necropsy a consolidated mass occupying 2/3 of the upper lung lobe was found to contain small cavities filled with mycelium and sporing heads of *Aspergillus fumigatus*. Mycelium was also present in the bronchioles and pulmonary vessels. Some veins and arteries were thrombosed and the fungus formed a network through the vessel wall into the thrombus. A second case of primary pulmonary aspergillosis in a patient suffering from duodenal ulcer was reported by LIBRACH (2). Death followed a massive melena. At necropsy the lungs were found to be studded with abscess cavities from which *A. fumigatus* was isolated.

HINSON et al (3) in a report of 8 cases of broncho-pulmonary aspergillosis described 3 of the mycetoma type and 3 others of particular interest as they had recurrent pyrexial attacks accompanied by collapse and consolidation of different parts of the lungs and by purulent sputum containing "plugs" in which *A. fumigatus* was present. The authors proposed a classification of the disease into saprophytic, allergic and pyaemic or septicaemic types.

Many of the cases have followed treatment of other conditions by antibiotics. ABBOTT et al (4) described a case of pneumonia treated with antibiotics in which at necropsy the lung contained a 5.0 cm cavity lined by mycelium and fruiting heads of *A. fumigatus*. In 1953 RANKIN (5) published an interesting case of disseminated aspergillosis and moniliasis associated with agranulocytosis and antibiotic therapy. DARKE et al (6) reported a case of acute pulmonary illness treated with antibiotics in which at necropsy an extensive pneumonic consolidation with scattered mycotic abscesses in both lungs and thrombosis of the smaller pulmonary arteries was found. Three cases of pulmonary aspergillosis occurring in persons working in a dust-filled atmosphere are reported. The first two, by HEPPLESTON & GLOYNE (7), were coal miners who had worked for over 30 years underground and both had pneumoconiosis. At necropsy, in addition to the usual features of pneumoconiosis the first man had an area of suppurative pneumonia with necrosis and many colonies of actively growing fungus and in the second case the bronchioles and alveoli contained numerous heads of *Aspergillus*. In connection with an investigation of pneumoconiosis in one of the mines, more than 80 rabbits were exposed underground and 2 developed pulmonary aspergillosis. The third case (Stevenson et al (8)) was a man who had worked in an atmosphere charged with dust from a cotton mill. X-ray revealed a large abscess cavity in lower left lobe and scattered infiltrations in both lungs. *A. fumigatus* isolated from sputum and bronchial secretion.

In an article dealing with non-reactive tuberculosis, O'Brien (9) described two cases of this disease which were associated with aspergillosis. In both cases the histology showed miliary areas of necrosis containing large numbers of acid-fast-bacilli, surrounded by normal cells or a minimal degree of tissue reaction. Foci of aspergillosis were found in the lungs of both cases.

References

1. Ross, C. F. (1951) A case of pulmonary aspergillosis (Aspergillus fumigatus). J. Path. Bact. **63**, 409—416.
2. Librach, I. M. (1957) Primary pulmonary aspergillosis: report of a fatal case. Antibiot. Med. **4**, 377—380.
3. Hinson, K. F. W., Moon, A. J. & Plummer, N. S. (1952) Bronchopulmonary aspergillosis: a review and a report of eight new cases. Thorax **7**, 317—333.
4. Abbott, J. D., Fernando, H. V. J., Gurling, K. & Meade, B. W. (1952) Pulmonary aspergillosis following post-influenzal bronchopneumonia treated with antibiotics. Brit. med. J. **i**, 523.
5. Rankin, N. E. (1953) Disseminated aspergillosis and moniliasis associated with agranulocytosis and antibiotic therapy. Brit. med. J. **i**, 918—919.
6. Darke, C. S., Warrack, A. J. N. & Whitehead, J. E. M. (1957) Pulmonary aspergillosis. Report of a case. Brit. med. J. **i**, 984.
7. Heppleston, A. G. & Roodhouse Gloyne, S. (1949) Pulmonary aspergillosis in coal workers. Thorax **4**, 168.
8. Stevenson, J. G. & Reid, J. M. (1957) Broncho-pulmonary aspergillosis. Report of a case. Brit. med. J. **i**, 985—986.
9. O'Brien, J. R. (1954) Non-Reactive Tuberculosis. J. clin. Path. **7**, 216.

HISTOPLASMOSIS

Histoplasmosis does not appear to be endemic in Britain. Limited histoplasmin surveys have not indicated the presence of autochthonous histoplasmosis. Only 16 cases have been published and in 2 of these the basis of diagnosis seemed to be rather inadequate (1). Of the remaining 14, all with the exception of one (2) have a history of sojourn overseas. Two of the cases occurred prior to 1946 and so are omitted from this survey, leaving 12 cases in 10 years. In 5 of the cases the diagnosis was confirmed by culture.

Three of the infections were generalized and fatal and among these was one contracted in Southern Rhodesia and diagnosed there, the diagnosis being confirmed in Britain by Cunningham & Garrod (3). The second generalized infection was reported by Locket et al (4). Although the clinical picture was very suggestive of histoplasmosis the histoplasmin skin test was negative. However, the diagnosis was confirmed at necropsy and *Histoplasma capsulatum* was isolated. A point of interest with regard to this case was the patient's strain of *H. capsulatum* was sensitive to an concentration of ethyl vanillate in vitro well below that of the blood levels of the drug during treatment. A third case of disseminated histoplasmosis was recorded by POLES & LAVERTINE (5). The suspected diagnosis was based on a laryngeal biopsy. Histoplasmin skin test was negative. At necropsy the diagnosis was confirmed histologically but attempts at culture were unsuccessful.

Four cases of localized non-fatal histoplasmosis were reported. Three of these were confirmed by culture and consisted of two cases with localized cutaneous lesions caused by the large African form of *Histoplasma* in Nigerian students recently arrived in London (SYMMERS (6)) and what is probably the first case of histoplasmosis to be contracted in Britain (SYMMERS (2)). In this case the patient had suffered from a benign sarcoidosis which resolved spontaneously. Later two small mobile lymph nodes appeared above the medial end of the left clavicle. A biopsy revealed histoplasma-like bodies and *H. capsulatum* was isolated from the second node. Histoplasmin skin test was positive, but the lungs were clear and no other lesions were found. 16 months later patient was reported to be in good health. The fourth was a case of laryngeal histoplasmosis (HUTCHISON (7)) admitted as a possible squamous carcinoma involving the anterior half of the right vocal cord. Re-examination and biopsy failed to confirm the previous diagnosis but revealed a histological picture of histoplasmosis. A second biopsy confirmed these findings but attempts at culture were unsuccessful. No other evidence of disease was found and spontaneous improvement occurred so that three years later the patient was still well.

Five cases of pulmonary histoplasmosis were diagnosed on the basis of calcified nodules in the lungs and a positive reaction to the histoplasmin skin test (8), (9), (10) and (11). In none of these was the diagnosis confirmed histologically or by culture. In two of the cases complement fixation tests were performed and titres varying from 1 : 8 to 1 : 64 were obtained in one case (8) and a titre of 1 : 10 in the other (9). Of the five cases, four were benign and healed (10) two cases; (11) and (8), but in the fifth case (9) the eventual fate of the patient was not reported.

Additional cases of histoplasmosis caused by the large African parasite have been identified in Britain in patients resident abroad, biopsy material having been sent to the Mycological Reference Laboratory. Two of these cases were published, CLARKE et al (12) and SILVERA et al (13), and five other cases, two of them from Nigeria which were confirmed by culture and three suspected cases, two from Ghana and one from the Congo in which the probable diagnosis was based on histological evidence, no material having been submitted for culture.

DUNCAN (14) published a short report on the morphology, in culture and in experimental infections, of the large tropical African type of *Histoplasma* which he regarded as a distinct variety of *H. capsulatum*, if not a different species. He had isolated the strain in 1943 from the first fully authenticated case of the peculiar tropical African form of histoplasmosis; the patient, an Englishman, had spent some years as a mining engineer in Ghana where he had contracted the infection.

References

1. Limerick, C. B. (1951) Histoplasmosis in England. Brit. med. J. **i,** 885.
2. Symmers, W. St. C. (1956) Histoplasmosis contracted in Britain: a case of histoplasmic lymphadenitis following clinical recovery from sarcoidosis. Brit. med. J. **ii,** 786—790.
3. Cunningham, G. J. & Garrod, L. P. (1950) Demonstration at 82nd Meeting of Path. Soc. of Gt. Britain & Ireland, London, December.
4. Locket, S., Atkinson, E. A. & Grieve, W. S. M. (1953) Histoplasmosis in Great Britain. Description of a second case of disseminated histoplasmosis: treatment by ethyl vanillate. Brit. med. J. **ii,** 857—860.
5. Poles, E. C. & Lavertine, J. D. O'D. (1954) Acute disseminated histoplasmosis with a report of a case occurring in England. Thorax **9,** 233—241.
6. Symmers, W. St. C. (1956) Localized cutaneous histoplasmosis. Brit. med. J. **ii,** 790—792.
7. Hutchison, H. E. (1952) Laryngeal histoplasmosis simulating carcinoma. J. Path. Bact. **64,** 309—319.
8. Leigh, R. & Thomas, H. E. (1955) Benign histoplasmosis. Thorax **10,** 253—257.
9. Arblaster, P. G. (1950) Pulmonary histoplasmosis. Thorax **5,** 333—339.
10. Crofton, J. (1950) A probable case of pulmonary histoplasmosis diagnosed in England. Thorax **5,** 340.
11. Sakula, A. (1953) A case of pulmonary histoplasmosis. Tubercle **34,** 18—20.
12. Clarke, G. H. V., Walker, J. & Winston, R. M. (1953) African Histoplasmosis. J. Trop. Med. Hyg. **56,** 277—280.
13. Silvera, W. D. & Konstam, R. G. (1954) A case of Histoplasma duboisii infection. West. Afric. med. J. **3,** 32.
14. Duncan, J. T. (1947) A unique form of Histoplasma. Trans. R. Soc. trop. Med. Hyg. **40,** 364.

ACTINOMYCOSIS

Porter (1) published a survey of actinomycosis (*A. israeli*) for the years 1936 to 1948 in North Eastern Scotland, a predominantly agricultural area. 98 cases were bacteriologically confirmed, 8 of which were fatal. The commonest site of infection was cervicofacial (75 %). Incidence of infection was highest in farmers, being 1 in 250 against 1 in 2,900 in the remainder of the male population. The reason for this predilection is un-explained in view of the fact that most infections are believed to be of endogenous origin.

Two years later Porter (2) published a survey covering the whole of Scotland for the same period. A total of 186 confirmed cases consisting of the 98 from the previous survey of the North West with a population of 440,000 and 88 from the remainder of Scotland including a large industrial belt and a population of 4,398,000. In the North West no significant difference was found between large towns and rural areas but in the remainder of Scotland the incidence was highest in small towns and rural areas.

In the whole survey, 78 % of the patients were male, 65 % of the lesions were cervico-facial and 19 % abdominal. 22 cases followed dental extractions and 33 others had carious teeth and 5 had facial injuries. 23 of the abdominal cases had had appendicetomy and 2 others followed gastric perforations.

Thoracic actinomycosis

Bates & Cruickshank (3) made a study of 85 cases of thoracic actinomycosis and proposed a system of grouping, namely Primary, Secondary and Metastatic. The primary pleuropulmonary was commonest with 44 cases, and secondary actinomycosis due to extension from abdominal or cervico-facial lesions accounted for 15. Cases of metastatic infection of the chest wall without involvement of the underlying pleura were also described. Additional cases of thoracic actinomycosis included: pulmonary actinomycosis associated with enlarged and infected (*A. israeli*) tonsils (Brinsley (4)); with thyroid involvement (Shorvon et al (5)); miliary pulmonary infiltration in a case of generalized pyaemia (Blainey et al (6)); massive empyema in right pleura (Bowyer (7)); a tumour on the chest wall (Rothfield (8)), and primary actinomycosis of the breast (Lloyd davies (9)).

The Gloyne Memorial Lecture of 1952 given by Professor L. P. Garrod (10) was devoted to a survey of actinomycosis of the lung based on the current literature and the lecturer's own experience, and included an investigation of the mouth flora and of 21 samples of saliva.

Abdominal actinomycosis

Reported cases of abdominal actinomycosis included: a case of pilonidal sinus complicated by perianal actinomycosis with involvement of the coccyx (Anscombe et al (11)); ileo- caecal actinomycosis (Pemberton et al (12)); hypokalaomia and renal actinomycosis following ureterocaecostomy (Le Brun et al (13)); with abscesses in the iliac and lumbar regions following perforated appendix (Kelly (14)); abdominal actinomycosis with subphrenic and liver abscesses (Torrens et al (16)); following appendicitis, a subphrenic actinomycotic abscess with perforation of the diaphragm and extension into the lung (Ross et al (17)) and following perforated gastric ulcer (Raper (18)). A case of actinomycosis of the pelvic organs was reported by Torrens et al (16) and of the testis by Scorer (19). Two cases of hepatic actinomycosis were reported, one was complicated by recurrent attacks of pleurisy (Bonney (20)), and the other was in a child (Shorvon (21)). A discussion on actinomycosis of the rectum and colon was contributed by Cope (15).

Actinomycosis with bone involvement

Two cases of actinomycosis of the spine were recorded by

Winston (22) and by Brett (23) and a summary of 15 cases since 1935 was given by Cope (24).

Cervico-facial actinomycosis

Cervico-facial actinomycosis following tooth extraction was reported by Bennett (25) and associated with dental sepsis by Coode (26). Torrens et al (16) recorded a case with pulmonary involvement and extension to the cervical spine, and Seligman (27) described an actinomycotic cold abscess in the neck.

Ocular actinomycosis

Six cases of actinomycosis of the lachrymal canaliculi with tissue invasion in one case were described by Moore (28) and *Actinomyces* (probably *A. israeli*) was isolated from 11 out of 15 patients with concretions in the canaliculi (Smith (29)).

Actinomycosis of the brain

Barter et al (30) gave an account of a large temporal lobe actinomycotic abscess and referred to 34 other cases in the literature.

Generalized actinomycosis

Three cases of generalized actinomycosis were reported. The first, a fatal case, of acute miliary actinomycosis following perforated gastric ulcer by Till (32) and two non-fatal infections, one with possible cardiac involvement (Savidge et al (33)) and the other a generalized pyaemia with miliary pulmonary infiltration (Blainey et al (6)).

Cope (34) delivered a Bradshaw lecture on "Viceral Actinomycosis" and Porter (35) gave an account of the etiology, clinical symptoms and treatment of actinomycosis.

Treatment

Penicillin. Recovery resulting from treatment with penicillin was recorded in cases of actinomycosis of the following anatomical regions:- Cervico-facial (Bennett (25)); thoracic (Bates & Cruickshank (3)); pulmonary (Prinsley (4)); actinomycotic empyema (Bowyer (7)); of the breast (Lloyd Davies (9)); generalized with possible cardiac involvement (Savidge et al (33)); and supplemented by sulphonamides in actinomycotic pyaemia (Blainey et al (6)); and supplemented by X-ray, sulphathiazole and potassium iodide in actinomycosis of the liver (Shorvon (21)); supplemented by streptomycin in spinal actinomycosis (Brett (23)). Unsuccessful treatment with penicillin was reported in cases of actinomycosis of the intestine by Pemberton et al (12) and Kelly (14), and of the testis by Scorer (19).

Streptomycin. Successful results were obtained with streptomycin therapy in the following types of actinomycosis:- abdominal with subphrenic and liver abscesses (Torrens et al (16)); pelvic organs (TORRENS et al (16)); cervico-facial (TORRENS et al (16)); of the chest wall (ROTHFIELD (8)); intestinal (PEMBERTON et al (12)); of the spine (WINSTON (22)); and supplemented by penicillin in actinomycosis of the spine (BRETT (23)). Ineffective treatment with streptomycin in actinomycotic pyaemia was reported by BLAINEY et al (6).

Aureomycin. Successful treatment with aureomycin was reported by SELIGMAN (27), for actinomycotic cold abscess in the neck, for actinomycosis of the intestine by KELLY (14) and of the subphrenic space by ROSS et al (17).

Sulphonamides. Temporary relief was obtained by sulphonamide therapy in a case of abdominal actinomycosis (TORRENS et al (16)); sulphonamides were successful when supplemented by penicillin in actinomycotic pyaemia (BLAINEY et al (6)) and supplemented by penicillin, X-ray and potassium iodide in a case of actinomycosis of the liver (SHORVON (21)).

Chloramphenicol. KELLY (14) reported temporary improvement in a case of intestinal actinomycosis following chloramphenicol therapy.

Potassium iodide. The use of potassium iodide brought about temporary relief in a case of abdominal actinomycosis (TORRENS et al (16)) and its successful use supplementing penicillin in actinomycotic empyema was reported by BOWYER (7), and supplementing streptomycin in a case of actinomycosis of the chest wall (ROTHFIELD (8)). Potassium iodide was used together with penicillin, X-ray and sulphathiazole in the successful treatment of actinomycosis of the liver (SHORVON (21)).

X-ray. X-ray therapy supplemented by penicillin, sulphathiazole and potassium iodide was reported to be successful in the treatment of actinomycosis of the liver (SHORVON (21)).

Surgery. Surgical methods were successful in the treatment of a case of actinomycotic brain abscess (BARTER et al (30)), and surgery supplemented by antibiotics in the successful treatment of abdominal and cervico-facial (TORRENS et al (16)), and of thoracic by BATES & CRUICKSHANK (3).

Surgical methods alone were unsuccessful in a case of intestinal actinomycosis but cure was ultimately effected by administration of streptomycin (PEMBERTON et al (12)).

In vitro studies on *Actinomyces israeli* include an assay of 5 antibiotics against 12 strains of *A. israeli* to ascertain the mean minimum inhibitory concentrations (GARROD (36)). These tests were repeated against *A. naeslundi* and closely similar results were obtained.

Cytological studies on the life cycle of *A. israeli* have been carried out by MORRIS (37). A study of the differentiation of the vegetative and sporogenous phases in actinomyces, including the lipid nature of the outer wall of the aerial mycelium, was made by ERIKSON (38) and of the factors affecting the development of the aerial mycelium

(39). Two cultural studies were carried out on *A. israeli*, one on the possibility of commensal organisms altering the morphological appearance of the colonies (Erikson et al (40)) and the other on the cultivation of *A. israeli* on a progressively less complex medium (Erikson et al (41)).

NOCARDIOSIS

Thoracic nocardiosis caused by *Nocardia asteroides* was included in the group of cases described by Bates & Cruickshank (3) and a fatal case of the same infection simulating acute miliary pulmonary tuberculosis was recorded by Hunter et al (42), together with a discussion on 73 cases recorded in the literature.

Secondary infection of wounds by both anaerobic and aerobic species of the actinomyces group were recorded by Cullen et al (31).

Observations on the life cycle of *Nocardia* have been carried out by Morris (43).

References

1. Porter, I. A. (1951) Actinomycosis in North-East Scotland. Brit. med. J. **i,** 1360—63.
2. Porter, I. A. (1953) Actinomycosis in Scotland. Brit. med. J. **ii,** 1084—86.
3. Bates, M. & Cruickshank, G. (1957) Thoracic actinomycosis. Thorax **12,** 99—124.
4. Prinsley, D. M. (1957) Pulmonary actinomycosis. Recovery in a Mongol. Brit. J. Tuberc. **51,** 40—45.
5. Shorvon, L. M. & Pearson, R. (1947) An unusual case of actinomycosis of the lung and thyroid. Brit. J. Tuberc. **41,** 64—68.
6. Blainey, J. D. & Morris, E. O. (1953) Actinomycotic pyaemia. Brit. med. J. **ii,** 913—915.
7. Bowyer, H. W. (1949) Actinomycotic empyema. Brit. Med. J. **ii,** 848.
8. Rothfield, N. J. (1954). Actinomycosis of the chest wall. Proc. Roy. Soc. Med. **47,** 127—128.
9. Lloyd Davies, J. A. (1951) Primary actinomycosis of the breast. Brit. J. Surg. **38,** 378—381.
10. Garrod, L. P. (1952) Actinomycosis of the lung. Aetiology, diagnosis and chemotherapy. Tubercle **33,** 258—266.
11. Anscombe, A. R. Hofmeyr, J. (1954) Perianal actinomycosis complicating pilonidal sinus. Brit. J. Surg. **41,** 666.
12. Pemberton, H. S. & Hunter, W. R. (1949) Intestinal actinomycosis treated with streptomycin. Lancet **256,** 1094—1095.
13. Le Brun, H. & Gilmour, I. E. (1953) Hypokalaomia and renal actinomycosis following ureterocaecostomy: report of a case. Brit. J. Urol. **25,** 132—135.
14. Kelly H. H. D. (1951) Intestinal actinomycosis treated with chloramphenicol and aureomycin: case report. Brit. med. J. **ii,** 779.
15. Cope, V. Z. (1949) Actinomycosis involving the rectum and colon. Proc. Roy. Soc. Med. **42,** 763.
16. Torrens, J. A. & Wood, M. W. W. (1949) Streptomycin in treatment of actinomycosis: report on three cases. Lancet **256,** 1091—1094.
17. Ross, J. A. & Knight, I. C. S. (1954) Actinomycosis of the subphrenic space. Edin. med. J. **61,** 170—174.
18. Raper, F. P. (1950) Abdominal actinomycosis following a perforated duodenal ulcer. Brit. J. Surg. **38,** 240—241.
19. Scorer, C. G. (1952) Actinomycosis of the testis. Brit. J. Surg. **40,** 244—247.
20. Bonney, G. L. W. (1947) Actinomycosis of the liver: report of an unusual case. Brit. J. Surg. **34,** 316—318.

21. Shorvon, L. M. (1948) Actinomycosis of the liver with recovery. Lancet **254,** 439.
22. Winston, M. E. (1951) Actinomycosis of the spine. Lancet **260,** 945.
23. Brett, M. S. (1951) Advanced actinomycosis of the spine treated with penicillin and streptomycin: report of a case. J. Bone Jt. Surg. **33,** 215—220.
24. Cope, V. Z. (1951) Actinomycosis of bone with special reference to infection of the vertebral column. J. Bone Jt. Surg. **33,** 205—214.
25. Bennett, D. T. (1953) A case of cervico-facial actinomycosis. Brit. dent. J. **94,** 154—155.
26. Coode, C. D. (1956) A case of actinomycosis. J. Roy. Nav. Med. Serv. **142,** 87—92.
27. Seligman, S. A. (1954) Treatment of actinomycosis with aureomycin. Brit. med. J. **i,** 1421.
28. Moore, J. G. (1952) Actinomycosis of the canaliculi with invasion of tissue in one case. Brit. J. Ophthal. **36,** 522—524.
29. Smith, C. H. (1953) Ocular actinomycosis. Proc. Roy. Soc. Med. **46,** 209—212
30. Barter, A. P. & Falconer, M. A. (1955) Actinomycosis of the brain. Report of a successfully treated case. Guy's Hosp. Rep. Lond. **104,** 35—45.
31. Cullen, C. H. & Sharp, M. E. (1951) Infection of wounds with Actinomyces. J. Bone Jt. Surg. **33,** 221—227.
32. Till, A. S. (1946) Acute miliary actinomycosis following perforated gastric ulcer. Brit. J. Surg. **34,** 93—95.
33. Savidge, R. S. & Davies, D. M. (1953) Generalized actinomycosis with possible cardiac involvement. Brit. med. J. **ii,** 136.
34. Cope, V. Z. (1949) Viceral actinomycosis. Brit. med. J. **ii,** 1311.
35. Porter, I. A. (1955) Actinomycosis. Practitioner **174,** 224—226.
36. Garrod, L. P. (1952) The sensitivity of Actinomyces israeli to antibiotics. Brit. med. J. **i,** 1263—1264.
37. Morris, E. O. (1951) The life cycle of Actinomyces bovis. J. Hyg. **49,** 46—51.
38. Erikson, D. (1947) Differentiation of vegetative and sporogenous phases of the actinomyces. 1. The lipid nature of the outer wall of the aerial mycelium. J. gen. Microbiol. **1,** 39—44.
39. Erikson, D. (1947) Differentiation of vegetative and sporogenous phases of the actinomyces. 2. Factors affecting the development of the aerial mycelium. J. gen. Microbiol. **1,** 45—52.
40. Erikson, D. & Porteous, J. W. (1955) Commensalism in pathogenic anaerobic actinomyces cultures. J. gen. Microbiol. **13,** 261—272.
41. Erikson, D. & Porteous, J. W. (1953) The cultivation of Actinomyces israeli in a progressively less complex medium. J. gen. Microbiol. **8,** 464—474.
42. Hunter, R. A., Willcox, D. R. & Woolf, A. L. (1954) Aerobic actinomycosis with a report of a case resembling miliary tuberculosis. Guy's Hosp. Rep. Lond. **103,** 196—206.
43. Morris, E. O. (1951) Observations on the life cycle of the Nocardia. J. Hyg. **49,** 175—180.

MISCELLANEOUS

General surveys

The first general survey of the fungus diseases in Britain was published by Duncan (1) at the end of 1945. This survey was based on the morbid material which had been submitted to him for diagnosis from all parts of Britain. In a second paper, Duncan (2) considered the epidemiology of fungus diseases as a whole.

Ainsworth (3) in a presidential address to the British Mycological Society gave an account of a century of medical and veterinary mycology in Britain, and Riddell (4 & 5) in two accounts of fungus diseases in Britain based largely on published works reviewed the more modern developments in medical mycology. LA TOUCHE (6) studied the epidemiology of fungus diseases and particularly of ringworm.

Isolated instances were reported of the following: a case of cerebral mucormycosis in an infant (KURREIN (7)); chromoblastomycosis, contracted abroad, in a West Indian domiciled in Britain (CROW et al (8)); a case of primary pulmonary coccidioidomycosis in a laboratory worker (NABARRO (9)), and a fatal case of supposed sporotrichosis in a child who had been diagnosed as having nasal diphtheria and from whom *C. diphtheriae* gravis type had been isolated was reported by BANKS (10). *Sporotrichum schencki* was said to have been grown from a throat swab.

Four cases of onychomycosis caused by *Scopulariopsis brevicaulis* were reported (MARTIN-SCOTT (11) 1 case, CAIRNS & CLOSE (12) 3 cases). In each case the infection was of the great toe nail.

MARTIN-SCOTT (13) studied the role of *Pityrosporum ovale* in seborrhoeic conditions and came to the conclusion, after studying 65 isolations from human skin, that the fungus had no causal connection with the morbid state. WHITLOCK (14) examined 200 normal scalps and concluded that *P. ovale* was not a causal agent of dandruff. ADAMSON (15) gave an account of leucodermic patches occurring in a case of pityriasis versicolor.

Farmer's Lung

Farmer's lung or thresher's lung, a syndrome associated with the inhalation of mouldy hay dust, occurs in the farming areas of Britain. The clinical features have been described in detail by MANN & MIALL (16) one case, STUDDERT (17) four cases and FULLER (18) thirty-two cases, who also distinguished three phases of the disease. WILLIAMS & MULHALL (19) described 10 cases among Welsh hill farmers and showed that there was a tendency to individual susceptibility as only 6 men out of 17 similarly employed on 6 farms developed symptoms.

A number of investigations have been carried out on the spore content of the air. The possible role of basidiospores as air borne allergens was discussed by GREGORY (20). AINSWORTH (21) studied the incidence of *Cladosporium* spores in urban and rural areas under various climatic conditions. STILLWELL (22) investigated the allergens in house dust and made a comparison with products derived from moulds, and HYDE et al (23) gave an account of allergy to mould spores in Britain.

Poisonous fungi

Reports of "mushroom poisoning "are rare in Britain but DURBASH & TEARE (24) described 4 fatal cases due to *Amanita phalloides* poisoning and refer to 14 previous records; LEWES (25) recorded 2 cases in German prisoners of war also due to *A. phalloides*.

Nomenclature

Suggestions on nomenclature have been made by the Medical Mycology Committee of the Medical Research Council (26) and by AINSWORTH (27), (28) and (29).

Fungicides

The assessment of the antifungal properties in vitro of a number of substances has been carried out, among which were: Trichothecin (FREEMAN (30)); 7 antibacterial substances of natural origin (SANDERS (31)); sodium propionate and its derivatives (HESELTINE (32)); bisisoquinolinium and bisquinolinium salts (COLLIER et al (33)) and the in vitro activity of 43 compounds were compared with the results of treatment of experimental *T. mentagrophytes* infections in guinea pigs by BUSHBY & STEWARD (34).

Technique

A number of new techniques have been devised and improvements have been made in older routine procedures. A droplet plate method for the isolation of dermatophytes was suggested by CURRY (35) and an unsealed hanging-drop technique for the rapid identification of Microsporum in hair by LA TOUCHE (36) Among new media produced was a standard "All British Mycological Culture Medium" published by CARLIER (37); a medium for the isolation of the yeast fungi by PEARSON (38); a liquid synthetic medium for the differentiation of *M. audouini* and *M. canis* by HUGHES (39); and a medium for the isolation of *P. ovale* by MARTIN-SCOTT (11). SHARVILL et al(40) confirmed the value of cycloheximide in the isolation of dermatophytes from heavily contaminated morbid material. FORSTER (41) devised a rapid method for the delivery of antibiotics into individual tubes of medium.

Methods for staining the dermatophytes in tissue included the use of Chlorozol Black E (CURRY (35)) and a confirmation of the use of the periodic acid schiff technique (SHARVILL (42)). AUSTWICK (43) showed that by a preliminary washing of cow hairs in distilled water a higher percentage of positive *T. verrucosum* cultures was obtained. AINSWORTH (44) recommended a method for the preparation of herbarium specimens of the dermatophytes including the preservation of morbid material and dried cultures.

References

1. DUNCAN, J. T. (1945) A survey of fungus diseases in Great Britain. Results from the first 18 months. Brit. med. J. **ii**, 715—718.
2. DUNCAN, J. T. (1948) The epidemiology of fungus diseases. Trans. Roy. Soc. trop. Med. Hyg. **42,** 207—216.
3. AINSWORTH, G. C. (1951) Presidential address. A century of medical and veterinary mycology in Britain. Trans. Brit. mycol. Soc. **34,** 1—16.

4. Riddell, R. W. (1951) Survey of fungus diseases in Britain. Brit. med. Bull. **7,** 197—200.
5. Riddell, R. W. (1956) Fungus diseases of Britain. Brit. med. J. **ii,** 783—786.
6. La Touche, C. J. (1957) Epidemiology of some fungus diseases with especial reference to ringworm. Med. Press. May. 412—417.
7. Kurrein, F. (1954) Cerebral mucormycosis. J. clin. Path. **7,** 141—144.
8. Crow, K. D. & Riddell, R. W. (1954) Chromoblastomycosis. Proc. Roy. Soc. Med. **47,** 655—657.
9. Nabarro, J. D. N. (1948) Primary pulmonary coccidioidomycosis. Case of laboratory infection in England. Lancet **254,** 982—984.
10. Banks, H. S. (1946) Sporotrichosis resembling diphtheria. Report of an unusual case. Lancet **251,** 270—272.
11. Martin-Scott, I. (1954) Onychomycosis caused by Scopulariopsis brevicaulis. Trans. Brit. mycol. Soc. **37,** 38—43.
12. Cairns, R. J. & Close, H. G. (1955) Onychomycosis caused by Scopulariopsis brevicaulis. Brit. J. Derm. **67,** 264—265.
13. Martin-Scott, I. (1952) The Pityrosporum ovale. Brit. J. Derm. **64,** 257—273.
14. Whitlock, F. A. (1953) Pityrosporum ovale and some scaly conditions of the scalp. Brit. med. J. **i,** 484—487.
15. Adamson, H. G. (1949) Pityriasis versicolor with subsequent leucodermic patches. Brit. J. Derm. **61,** 322—323.
16. Mann, B. & Miall, W. (1952) A case of farmer's lung. Tubercle **33,** 48—49.
17. Studdert, T. C. (1953) Farmer's lung. Brit. med. J. **i,** 1305—1309.
18. Fuller, C. J. (1953) Farmer's lung: a review of present knowledge. Thorax **8,** 59—64.
19. Williams, D. I. & Mulhall, P. P. (1956) Farmer's lung in Radnor & North Breconshire. A report of ten cases. Brit. med. J. **ii,** 1216—1218.
20. Gregory, P. H. & Hirst, J. M. (1952) Possible role of basidiospores as air-borne allergens. Nature, Lond. **170,** 414.
21. Ainsworth, G. C. (1952) The incidence of air-borne Cladosporium spores in the London Region. J. gen. Microbiol. **7,** 358—361.
22. Stillwell, D. E., Rimington, C. & Maunsell, K. (1947) The allergens of house dust: comparison with products derived from moulds. Brit. J. exp. Path. **28,** 325.
23. Hyde, H. A., Richards, M., & Williams, D. A. (1956) Allergy to mould spores in Britain. Brit. med. J. **i,** 886.
24. Dubash, J. & Teare, D. (1946) Poisoning by Amanita phalloides. Brit. med. J. **i,** 45—47.
25. Lewes, D. (1948) Mushroom poisoning due to Amanita phalloides. Brit. med. J. **ii,** 383—385.
26. Med. Res. Council Memor. 23. 12 pp. London H. M. Stationery Office 1949. Nomenclature of fungi pathogenic to Man & Animals.
27. Ainsworth, G. C. (1949) Fungi and fungus diseases. Brit. J. Derm. **61,** 421—4.
28. Ainsworth, G. C. (1950) List of fungi recorded as pathogenic for Man and Higher Animals in Britain. Trans. Brit. mycol. Soc. **32,** 318—336.
29. Ainsworth, G. C. & Georg, L. K. (1954) Nomenclature of the faviform Trichophytons. Mycologia **46,** 9—11.
30. Freeman, G. G. (1955) Further biological properties of trichothecin, an antifungal substance from Trichothecium roseum Link and its derivatives. J. gen. Microbiol. **12,** 213—221.
31. Sanders, A. G. (1946) Effect of some antibiotics on pathogenic fungi. Lancet **250,** 44—46.
32. Heseltine, W. W. (1952) Sodium propionate and its derivatives as bacteriostatics and fungistatics. J. Pharm. Lond. **4,** 577.
33. Collier, H. O. J., Potter, M. D. & Taylor, E. P. (1955) Antifungal activities of bisisoquinolinium and bisquinolinium salts. Brit. J. Pharm. Chemother. **10,** 343—348.
34. Bushby, S. R. M. & Steward, S. M. (1949) Experimental assessment of therapeutic efficiency of antifungal substances. Brit. J. Derm. **61,** 315—321
35. Curry, J. (1949) A droplet culture method for fungus isolation, and a staining method for diagnosis of epidermophytosis. Brit. J. Derm. **61,** 54—58.

36. La Touche, C. J. (1951) An unsealed hanging-drop technique for the investigation of Microsporum in hair. Brit. J. Derm. **63,** 8—15.
37. Carlier, G. I. M. (1948) An all-British mycological culture medium. Preliminary note. Brit. J. Derm. **60,** 61—63.
38. Pearson, T. (1950) The identification of yeast-like organisms from the vagina. Bull. Inst. Med. Lab. Technol. **15,** 104.
39. Hughes, J. W. (1952) A liquid synthetic medium suitable for the differentiation of M. audouini Gruby 1843 and M. canis Bodin 1902. Brit. J. Derm. **64,** 334—338.
40. Sharvill, D. & Talbot, J. M. (1954) Cycloheximide in the isolation of dermatophytes. Brit. J. Derm. **66,** 214—217.
41. Forster, R. A. (1956) A useful method for the addition of antibiotics to culture media. J. Med. Lab. Technol. **13,** 417—418.
42. Sharvill, D. (1952) The periodic acid-schiff stain in the diagnosis of dermatomycoses. Brit. J. Derm. **64,** 329—333.
43. Austwick, P. K. C. (1954) The isolation of Trichophyton discoides from cattle. Vet. Rec. **66,** 224—225.
44. Ainsworth, G. C. (1954) Herbarium specimens of dermatophytes. Mycologia **46,** 110—111.

ANIMAL MYCOSES

The distribution and economic importance of animal mycoses has been gaining increasing recognition. An early survey of fungus diseases of animals in Britain (Ainsworth (1)) was followed by a two-year survey in which 657 cases of mycotic or suspected mycotic infection were investigated. This survey was concerned with identifying the fungi found in association with morbid conditions but was not a clinical study of animal mycoses (Ainsworth (2) and Ainsworth & Austwick (3) and (4)). Ringworm was the most frequently encountered infection. Candidiasis, aspergillosis and mucormycosis were investigated and attention was paid to bovine mycotic abortion. The first case of haplomycosis in a mole was recorded.

Ringworm

Cattle ringworm caused by *Trichophyton verrucosum* var. *discoides* occurs commonly in Britain. McPherson (5) in a survey of cattle in Northern Britain found 133 herds out of 518 to be infected. Ford (6) gave a detailed account of an outbreak amongst a herd of short-horn cattle. Investigations into the problem have been carried out at Leeds. La Touche (7) made observations on naturally occurring infections in calves and this was followed up by Sellars et al (8) who compared natural and experimentally produced lesions in calves and studied the factors affecting natural transmission. Sellars (9) discussed some of the problems encountered in the evaluation of treatment and spontaneous cure.

References are frequently made to *T. mentagrophytes* as a cause of cattle ringworm but in Britain in the last 10 years only one instance of such an infection has been recorded (Gentles et al (10)), and one at an earlier date by Muende & Webb (11). An outbreak of *T. mentagrophytes* infection among pigs in Britain was recorded for the first time by McPherson (12), and an outbreak of fowl favus (*T. gallinae*) affecting 40 hens was investigated by Carnaghan et al (13).

Although *T. verrucosum* is frequently isolated from cattle it rarely occurs in other animals, but two instances of infection of dogs occurred, one reported by Gentles et al (10) and the other isolated at the Mycological Reference Laboratory from a farm dog.

A clinical and microscopical study of *Microsporum canis* infections in 45 cats and kittens showed that crusts occurred in only 4 cases. The lesions in some of the animals consisted merely of a few infected hairs, the value of Wood's lamp was stressed and details of the characters of infected scales, hairs and whiskers were given by La Touche (14). La Touche also studied the occurrence of onychomycosis caused by *M. canis* in cats and gave details of his findings in 4 cases (15).

Candidiasis

Candidiasis (moniliasis) in poultry and the serious economic losses incurred due to the high mortality among turkey poults is well known and the problem has been investigated by Blaxland (16 In 4 out of 5 outbreaks among young turkeys on five farms, other factors besides the fungus were involved. In routine post-mortem examinations of 55 turkeys and 63 fowls, 14 of the turkeys and 9 of the fowls were found to be harbouring *Candida albicans*, but all the birds were suffering from other pathological conditions. Blaxland (17) doubted if *Candida albicans* was a primary cause of disease in turkeys as it was present both in normal and diseased birds. He suggested that some predisposing factor was necessary as the disease was reproduced experimentally only with difficulty.

Observations on experimental transmission among poults (Blaxland et al (18)) showed that with either the use of pure cultures or infected crop scrapings most of the birds could be infected but only a few showed clinical symptoms of disease. In a survey of clinically healthy poults from various parts of the country it was found that *C. albicans* could be present and cause even gross crop lesions without manifestation of clinical symptoms. Bad flock hygiene and poor nutrition were suspected to be contributing factors in candidiasis.

Other observations on candidiasis and crop lesions in turkeys have been made by Buxton et al (19) and on *C. albicans* infection of the skin of turkeys by Soliman et al (20). The incidence of *C. albicans* in the crops of fowls was investigated by Jordan (21); of 378 fowls examined 81 yielded *C. albicans* but in only 13 were any lesions observed and in no case was *C. albicans* considered to be the cause of death. The highest incidence occurred in the "under 2 months" and "6 months" groups.

An outbreak of acute mastitis in 11 out of 26 cows in a dairy herd following an infusion of the udders with penicillin was reported by Stuart (22). A species of *Candida* was isolated and the condition was reproduced experimentally.

Aspergillosis

Aspergillosis among captive wild birds frequently occurs. Ainsworth & Rewell (23) gave an account of 78 cases occurring between September 1946 and September 1948 at the London Zoo. More recently interest has been aroused by this disease in poultry and Jordan (24) and (25) has made examinations of growing and adult birds. Brookbank & Austwick (26), investigating a severe outbreak in a Lancashire hatchery, found differences in susceptibility between inbred and outbred chicks. At the Wild Fowl Trust aspergillosis causes much of the mortality among pink-footed geese. Sladen & Austwick (27), in a study of the problem, examined 294 throat swabs taken from pink-footed geese in their feeding grounds in Iceland and Scotland, and although saprophytic fungi were present *Aspergillus fumigatus* was not isolated.

McDiarmid (28) has shown that aspergillosis occurs in British wild birds in natural conditions; between 1943 and 1953 he found this infection in 3 herring gulls, 1 jackdaw and 14 wood pigeons. Poulding (29) found 5 cases of aspergillosis among immature gulls (4 herring gulls and a lesser black-backed gull). Ainsworth et al (3) found aspergillosis in a variety of birds both wild and captive.

Aspergillosis also occurs in mammals. Ainsworth & Rewell (30) reported a case in a 12-year old captive American bison, and Ainsworth & Austwick (3) isolated the fungus from guinea pigs, sheep, cattle and pigs.

Haplomycosis

A new host record and a new European record was obtained by the isolation of *Haplosporangium parvum* from the lungs of moles (*Talpa europaea*) in Devonshire (McDiarmid & Austwick (31)).

Trevis (32) recorded spherules in the lungs of rodents trapped in Dorset which he identified histologically as *H. parvum*, the rodents concerned being *Apodemus sylvicatus*, *A. flavicollis* and *Clethrionomys glareolus*.

Epizootic lymphangitis

A detailed account of epizootic lymphangitis was given by Bullen ((33) and (34)) and a study of the yeast-like form of *Histoplasma farciminosum* was made (Bullen (35)).

Mycotic abortion

An investigation of the fungi associated with bovine abortion has been carried out by Austwick et al (36). The basis of diagnosis was the presence of hyphae in the foetal stomach contents or in the necrotic cotyledons confirmed by the isolation of the fungus. Of the 601 foetuses and 52 placentas examined, 41 were diagnosed as cases of mycotic abortion. *Aspergillus fumigatus* accounted for 29 of the cases and *Absidia ramosa* for 4. *Candida tropicalis* and a basidiomycete were also isolated.

Abomasal abscess

Gitter & Austwick (37) carried out post-mortem examinations on 208 calves and in 7 found severe abomasal abscesses. In all 7 fungal hyphae of a mucoraceous type were present but in each case the fungus failed to grow in culture.

Marine

A new species of the Saprolegniaceae, *Leptolegnia marina* n. sp. was reported to cause destructive lesions on the pea crab (*Pinnotheres pisum*) by Atkins (38).

Actinomycosis

Actinomycosis caused by *A. bovis* occurs in Britain but the disease in cattle often remains unpublished. However, 6 infections in cattle involving the upper and lower jaw were reported (Lewis (39)) in which cure was effected by penicillin. A case of actinomycosis of the jaw of a spaniel was described by Morant (40). *A. bovis* was isolated and the animal was cured by surgery and penicillin therapy. Two cases of nocardiosis in dogs were recorded. *Nocardia asteroides* was isolated from a throat sinus in an Alsation which was subsequently cured by penicillin (Ginsberg et al (41)). The second, a fatal case, was in a greyhound and the fungus isolated was probably *N. asteroides* (McGaughey et al (42)).

Lumpy wool on sheep caused by *Actinomyces dermatonomus* has been recognized in Britain since 1949 and the incidence has increased until in 1955 a number of outbreaks occurred in various parts of the country (Kane et al (43)). One such outbreak among black-faced sheep in Argyllshire was described by Nisbet et al (44).

Published advice on treatment included the successful use of "Tinevet" in the treatment of bovine ringworm (Forster (45)) and phenyl-mercuric ointment in a case of tinea in a dog (Kirk (46)). At a poultry research station penotrane was found to be effective in vitro against *Candida albicans* and *Aspergillus fumigatus* (Horton-Smith & Long (47)).

A symposium on fungus diseases was held in 1950 and a brief report was made by Ainsworth (48).

References

1. Ainsworth, G. C. (1948) Fungous diseases of Animals in Britain. Vet. Rec. **60**, 2.

2. Ainsworth, G. C. (1954) Fungoid infections of Animals in Britain. Vet. Rec. **66,** 844—849.
3. Ainsworth, G. C. & Austwick, P. K. C. (1955) A survey of animal mycoses in Britain: general aspects. Vet. Rec. **67,** 88—97.
4. Ainsworth, G. C., & Austwick, P. K. C. (1955) A survey of animal mycoses in Britain: mycological aspects. Trans. Brit. mycol. Soc. **38,** 369—386.
5. McPherson, E. A. (1957) A survey of the incidence of ringworm in cattle in Northern Britain. Vet. Rec. **69,** 674—679.
6. Ford, E. J. H. (1956) Ringworm in cattle: an account of an outbreak. Vet. Rec. **68,** 803—806.
7. La Touche, C. J. (1952) Some observations on ringworm in calves due to T. discoides Sab. Vet. Rec. **64,** 841—842.
8. Sellers, K. C., Sinclair, W. B. V. & La Touche, C. J. (1956) Preliminary observations on natural and experimental ringworm in cattle. Vet. Rec. **68,** 729—732.
9. Sellers, K. C. (1956) Cattle ringworm: problems in the evaluation of treatment. Anal. Chem. **28,** 271.
10. Gentles, J. C., & O'Sullivan, J. G. (1957) Isolation of ringworm fungi from unusual hosts. Vet. Rec. **69,** 132.
11. Muende, I., & Webb, P. (1937) Ringworm fungus growing as a saprophyte under natural conditions. Arch. Derm. Syph. **36,** 987.
12. McPherson, E. A. (1956) Trichophyton mentagrophytes: natural infection in pigs. Vet. Rec. **68,** 710—711.
13. Carnaghan, R. B. A., Gitter, M., & Blaxland, J. D. (1956) Favus in poultry: an outbreak of Trichophyton gallinae infection. Vet. Rec. **68,** 600-601.
14. La Touche, C. J. (1953) Some clinical and microscopic features of M. canis Bodin infection of the skin and its appendages as it occurs in the cat. Vet. Rec. **65,** 680—681.
15. La Touche, C. J. (1955) Onychomycosis in cats infected by Microsporum canis Bodin. Vet. Rec. **67,** 578—579.
16. Blaxland, J. D., & Fincham, I. H. (1950) Mycosis of the crop (moniliasis) in poultry, with particular reference to serious mortality occurring in young turkeys. Brit. vet. J. **106,** 221—231.
17. Blaxland, J. D. (1951) The causes of epidemic outbreaks of moniliasis in turkeys. Off. Rep. World's Poult. Cong. Paris Pages 21—27.
18. Blaxland, J. D., & Markson, L. M. (1954) Observations on the transmissibility and pathogenesis of moniliasis in turkey poults. Brit. vet. J. **110,** 139—145.
19. Buxton, A., Darcel, C. le Q., gordon, R. F. & Horton Smith, C. (1949) Suspected moniliasis in turkeys. Vet. Rec. **61,** 828—829.
20. Soliman, K. N., & Rollinson, D. H. L. (1951) Mycotic infection of the skin of the turkey. Vet. Rec. **63,** 20—24.
21. Jordan, F. T. W. (1953) The incidence of Candida albicans in the crops of fowls. Brit. vet. J. **109,** 527—530.
22. Stuart, P. (1951) An outbreak of bovine mastitis from which yeasts were isolated and attempts to reproduce the conditions experimentally. Vet. Rec. **63,** 314.
23. Ainsworth, G. C., & Rewell, R. E. (1949) The incidence of aspergillosis in captive wild birds. J. comp. Path. **59,** 213—224.
24. Jordan, F. T. W. (1954) The incidence of fungi in the lungs of poultry. Brit. vet. J. **110,** 25—26.
25. Jordan, F. T. W. (1956) Some observations on respiratory disease in poultry. Vet. Rec. **68,** 554—558.
26. Brooksbank, N. H., & Austwick, P. K. C. (1955) Susceptibility of inbred and outbred chicks to aspergillosis. Brit. vet. J. **111,** 65—67.
27. Sladen, W. J. L., & Austwick, P. K. C. (1955) The mycoflora of wild pink-footed geese sampled in Iceland & Scotland 1953. Rep. Wild. Fowl Trust 1953—1954, 133—138.
28. McDiarmid, A. (1955) Aspergillosis in free-living wild birds. J. comp. Path. **65,** 246—249.
29. Poulding, R. H. (1952) Five cases of aspergillosis in immature gulls. Ibis. Lond. **94,** 364—366.

30. Rewell, R. E., & Ainsworth, G. C. (1947) Occurrence of Aspergillus fumigatus Fresen. in the lung of an American Bison. Nature. Lond. **160,** 362.
31. McDiarmid, A., & Austwick, P. K. C. (1954) Occurrence of Haplosporangium parvum in the lungs of the mole (Talpa europaea.) Nature. Lond. **174,** 843-844.
32. Trevis, L. (1956) Additional records of Haplosporangium parvum in mammals in Britain. Nature. Lond. **177,** 437.
33. Bullen, J. J. (1950) Epizootic Lymphangitis. J. Roy. Army Vet. Cps. **21,** 158—159.
34. Bullen, J. J. (1951) Epizootic Lymphangitis. J. Roy. Army Vet. Cps. **22,** 8—11.
35. Bullen, J. J. (1949) The yeast-like form of Cryptococcus farciminosus (Rivolta) (Histoplasma farciminosum). J. Path. Bact. **61,** 117—120.
36. Austwick, P. K. C., & Venn, J. A. J. (1957) Routine investigations into Mycotic Abortion. Vet. Rec. **69,** 488—491.
37. Gitter, M., & Austwick, P. K. C. (1957) The presence of Fungi in Abomasal Ulcers of Young Calves: a report of seven cases. Vet. Rec. **69,** 924—928.
38. Atkins, D. (1954) Further notes on a marine member of the Saprolegniaceae. Leptolegnia marina n. sp. infecting certain invertebrates. J. Mar. biol. Ass. U. K. **33,** 613—625.
39. Lewis, E. F. (1947) Penicillin therapy in actinomycosis in cattle. Vet. Rec. **59,** 435.
40. Morant, K. M. (1951) Actinomycosis in a dog. Vet. Rec. **63,** 82.
41. Ginsberg, A., & Little, A. C. W. (1948) Actinomycosis in Dogs. J. Path. Bact. **60,** 563.
42. McGaughey, C. A., Bateman, J. K., & Mackenzie, P. Z. (1951) Actinomycosis in a Dog. Brit. vet. J. **107,** 428.
43. Kane, G. J., Downing, W., & Wilsdon, A. J. (1955) Mycotic dermatitis in Great Britain. Vet. Rec. **67,** 779.
44. Nisbet, D. I., & Bannatyne, C. C. (1955) A dermatitis of sheep associated with an organism of the genus actinomyces. Vet. Rec. **67,** 713—715.
45. Forster, J. (1957) A clinical trial of a new treatment for bovine ringworm. Vet. Rec. **69,** 519—521.
46. Kirk, H. (1946) Organo-mercury compounds in veterinary medicine. Vet. Rec. **58,** 299.
47. Horton-Smith, C., & Long, P. L. (1952) The effect of penotrane on the growth in vitro of C. Albicans and A. fumigatus. J. comp. Path. **62,** 266—274.
48. Ainsworth, G. C. (1950) Fungus diseases of animals. Nature, Lond. **166,** 547.

CRITICAL SURVEY OF MYCOLOGICAL RESEARCH AND LITERATURE IN YOUGOSLAVIA UP TO 1957.

by

E. I. Grin [1] & L. Ožegović [2]

(28.II.1958)

L. Glück (34), in 1894, gave the first information regarding the prevalence of mycotic diseases in the territory of present Yougoslavia, as to the dermatophytes in the Peoples Republic of Bosnia and Herzegovina. Glück observed on the occasion of medical examination of recruits (1890—1982) out of 52,345 young men, age 20—22 year, 1,738 cases (33.2 %) of favus infection of the scalp. It is interesting that the incidence of tinea favosa at that time was less in Western regions of Bosnia and Herzegovina (with exception of some districts) than in areas on the border of Sandžak and Serbia and that the population in towns was more infected than the rural population. Glück could further observe that the largest part of the infected population was Moslems and Jews. He expressed the opinion that some causal connection may exist between microtrauma of the scalp due to the religious custom of shaving the hair and the subsequent fungus infection. His indication to have observed goats and cats infected with favus is not in keeping with the results obtained in this area by Grin, Ožegović & Vasiljević (39).

Later, so far as is known, until the first papers by Milošević in 1932, there was no information on mycological research in Yougoslavia. Milošević (81) reported first the results of isolated dermatophytes in Belgrade from 100 patients belonging to various regions of Yougoslavia. It is interesting to note in relation to the above mentioned statement by Glück (34) that Milošević could demonstrate the largest number of favus cases in rural population. He could also prove that *T. faviforme album* is able to produce a typical clinical picture of tinea favosa with formation of characteristic scutula. Milošević (32, 82, 84, 95, 108, 112) worked out this problem in several publications. He reported (82, 84) his first case on scutulous favus on the scalp caused by *T. faviforme album* in a young peasant, age 17. In that paper Milošević discussed the genus *Achorion* as described by Sabouraud and came to the conclusion that it is illogical to form a genus according to clinical manifestations only, since different dermatophytes are able to produce similar alterations with formation of scutula, although they are not Achorions. Milošević was considering the same problem in 1934 (84) describing the similarity of *T. faviforme album* and *A. schoenleini* on the respective cultures, presuming that botanically *A. schoenleini* is in fact a *Trichophyton*.

---

[1]) Dr. E. I. Grin is Director of Central Dispensary for Skin and Venereal Diseases in Sarajevo.

[2]) Dr. L. Ožegović is Ass. Prof. of Internal Diseases in the Veterinary Faculty of University of Sarajevo.

Original data by Milošević [81] (1932)

Species	Scalp	Beard	Glab. Skin	Scalp and glab. Skin	Nails	Total
T. schoenleini	11	0	0	1	0	12
T. faviforme alb.	9	0	0	0	0	9
T. violaceum	39	1	2	1	0	43
T. langeroni	2	0	0	0	0	2
Trichophyton	3	0	0	0	0	3
Ct. mentagroph.	1	0	3	0	0	4
S. (M.) audouini	27	0	0	0	0	27
						100

Georgjević & Milošević (32) have found in 241 cases of dermatomycoses *T. faviforme album* 81 times (33.6 %), *T. violaceum* 87 times (36.1 %) and other dermatophytes 73 times (30.3 %). *T. faviforme album* caused superficial manifestations of the skin, kerions and typical tinea favosa with scutula. The authors are inclined to give their findings great significance because of the predominantely rural population in Yougoslavia. Milošević & Milovanović (108), also Kićevac & Milošević (57), underlined still more the importance of *T. faviforme album* in producing the clinical picture of favus and stated that in Yougoslavia, as a rule, *T. faviforme album* is actually the causative organism of favus and not *A. schoenleini* as in other countries. This statement, however, is not in accordance with later investigations made by other authors (Čajkovac, 16, 18, 19, — Fleger, 29, — Ignjatović, 50, 51, — Grin, Ožegović & Vasiljević, 39 — and others) who could establish the fact that in Yougoslavia *A. schoenleini* is the most common fungus producing tinea favosa even in the rural population, especially in endemic areas.

Kićevac & Milošević (57) and Milošević & Milovanović (107) considering the difficulties to differentiate in culture *A. schoenleini* from *T. faviforme album*, suggested to use the experimental way of inoculation in so far as *T. faviforme album* should be easily inoculable in guinea pig producing typical scutula. The authors have also recommended measures for controlling favus infections in man by eliminating the reservoir of parasites in animals.

Milovanović (114) observed a case of favus of the scalp and glabrous skin in a 17 days old child. The child contracted the infection from its mother when it was 4 days old. The organism recovered on culture was *T. faviforme album*. The author assumed that the postuterine infection of the child might have been facilitated by allergic condition acquired in its intrauterine life. MILOŠEVIĆ (95) continuing his investigations on tinea favosa in man concluded that all species and varieties described up to then which cause tinea favosa in man (*A. schoenleini*, var. *mongolica*, *A. formoseum*, *Arthrosporia gougeroti*, *A. actoni*) can be reduced to 3 groups described by LANGERON & BAEZA [1]: type I — *A. schoenleini*, type II — with nonspongy colonies adherent to the medium on Sabouraud's dextrose agar, and type III — Miloševici. Based on the great similarity between *A. schoenleini* and *T. faviforme album* (on culture, in microscopical and clinical appearence) and the statement made by LANGERON & BAEZA, that *Trichophyton* infections in animal caused by *T. faviforme* megasporums parallel the number of tinea favosa in children, caused by Achorions, MILOŠEVIĆ (95) advanced the hypothesis that the organism of human favus (*A. schoenleini*) is developed from a certain strain of *T. faviforme album* which in course of time became adapted to the human host. The various strains which have been developed later constitute only the types described by LANGERON & BAEZA. By analogous hypothesis MILOŠEVIĆ (95) assumed that *M.* (*S.*) *audouini* represents a *Microsporum* of animal origin adapted to the human host and that the variants of *megasporum faviforme* group of Trichophytons (*T. discoides*, *T. ochraceum*, *T. immergens* and others) might be only membres of the great family of *T. faviforme album*.

MILOŠEVIĆ & SUHAČEVA (112) studying 33 different strains of *A. schoenleini* on glucose medium for a period of at least 2½ years came to the conclusion that there are many unstable modifications in growth of this dermatophyte but at the same time they did not have opportunity to observe the strain described by SABOURAUD. The authors were therefore of the opinion that the species defined by LANGERON & BAEZA do not possess sufficient characteristics to claim specificity. They admit the possibility of mutations but because of the particular pattern in which the organism of tinea capitis favosa is occurring in Yougoslavia, MILOŠEVIĆ & SUHAČEVA assumed that this phenomenon is the result of the evolution of this parasite under specific conditions.

Most attention was paid by MILOŠEVIĆ and his coworkers to the principal elements in the morphology of dermatophytes. Besides the classical work by LANGERON & MILOŠEVIĆ (65,66) regarding the morphology of dermatophytes on natural and such media containing polysaccharids (MILOŠEVIČ 72, 73, 74, 98, 99) they investigated as well the growth of dermatophytes on media to which honey was added instead of sugar (Milošević 79). Some papers are dealing also with practical mycology for general practitioners: Milošević & Ekersdorf (106, 107), Milošević (86, 92), Čajkovac (22), Barjaktarević & Bajić (7), Grin (35) and others.

---

[1] LANGERON, M. & M. BAEZA: Annal. Parasit. hum. comp. **XIV**, 385—402, 1936.

After the second publication by Langeron & Milošević (65) concerning the classification of dermatophytes Milošević devoted several more papers to this problem critically evaluating the subject (93, 96). Milošević suggested that a very careful study of dubious species should be done, before declaring them as new ones or discarding them.

Milošević (78) discussing the problem of glabrous, non-pleomorphic cultures of dermatophytes, pointed out that such cultures are not degenerated but still pathogenic and adapted only to human beings; if they are poor on the classical media, however, on the natural media they are growing different, showing again a rich fungal morphology. The pleomorphism of dermatophytes was studied by Milošević & Simić (109, 128), Langeron & Milošević (68), Milošević & Suhačeva (111) and Milošević & ekersdorf (105).

Kogoj (58, 59) published the results of his most interesting investigations regarding the localisation of fungus infection in animals after various ways of inoculation. It was possible to demonstrate that the outcome of inoculation and the site of lesion depended, as a rule, upon the intensity of local irritation.

Djordjević, Milošević & Pavlović (25) have investigated the fungicidal action of different chemical compounds on hair infected with *M. audouini* and came to the conclusion that fungicides like hydrogen (20 %), formalin (1—3 %), sapo kalinus (1 : 2) and some others may be useful in lessening the contagiosity of infected children. Simić & Milošević (128) have investigated the influence of beta and gamma rays on *T. mentagrophytes* and *T. radiolatus*. It could be demonstrated that cultures exposed to radium rays are in general retarded in growth (the action depending upon distance and time); under the influence of beta and gamma rays the cultures of *T. mentagrophytes* are producing a transitory violet pigment and those of *T. radiolatus* a green one. Beta and gamma rays applied to cultures immediately after inoculation are inhibiting pleomorphism, but applied to cultures already developed they act retarding. Further, beta and gamma rays are able to change pleomorphic cultures into such of powdery appearence.

Langeron & Milošević (68) reinvestigated the findings reported by Dey & Acton [1] regarding the possibility to regenerate cultures already pleomorphic, on feathers, and they were able to show that dry cultures of dermatophytes when reinoculated from feathers on classical media are becoming again pleomorphic. Milošević & Suhačeva (111) could demonstrate that the appearence of pleomorphism developed much slower when adding to the media trichophytin from strains of *T. asteroides*. They had the impression that the action was more intensive using trichophytin obtained from pleomorphic cultures than from non-pleomorphic strains. MILOŠEVIĆ & EKERSDORF (105) tried to infect guinea pigs with pleomorphic cultures of *M. felineum*, *M. lanosum*, *M. fulvum* and *M. gypseum*, *T. mentagrophytes* and *radiolatum*, *T. persicolor* and *immergens*. The inoculation gave positive results only with *M. felineum* and *lanosum* and with *T. mentagrophytes* and *radiolatum*. The authors made following observations: 1) pleomorphic cultures of dermatophytes produced lesions of endothrix type; 2) in lesions which were of sui generis type septate intertwined mycelia could be found filling the hair and terminating with a frange; 3) pathogenicity of pleomorphic cultures was always of lesser degree than that of original cultures, and in time, the pathogenicity disappeared completely.

---

[1]) Acton, H. N. & N. C. Dey: Indian med. Gaz. **XIX**, 601, 1934.

The problem of allergy and immunity in dermatophytes was elaborated by LANGERON & MILOŠEVIĆ (67).

In a didactic-polemical manner MILOŠEVIĆ (80) discussed the question whether the fungi of genus *Alternaria* are able to cause tinea capitis and commented, at the same time, on the paper by VILAS-BOAS NETO & CESAR [1] who have described a case of mycosis due to *E. nigricans* (i.e. *alternaria*).

MILOŠEVIĆ has described 3 new dermatophytes occurring in Yougoslavia: 1) *T. langeroni* (MILOŠEVIĆ, 1931) (77) a microide endothrix, but in cultures retaining the macro- and microscopic appearence of faviforme type of megasporums, showing however radiate branches and growing into the medium; 2) *T. bossae* (MILOŠEVIĆ, 1935) (89), isolated from a case of sycosis barbae. It was an endothrix infection with large spores and the flat culture was growing fast, producing a diffusible green pigment. The microscopic morphology of the culture differed from *T. persicolor* by green pigment, late appearence of pleomorphism and greater pathogenicity to guinea pigs; 3) *T. immergens* (MILOŠEVIĆ, 1937), a *Trichophyton* of *megasporum* type was isolated by MILOŠEVIĆ (97, 102) from patients as well as from cattle. It is remarkable that no one of these dermatophytes was hereafter noticed in mycological literature in Yougoslavia.

MILOŠEVIĆ (88) was the first to demonstrate *T. rubrum* (with endothricial spores) as the organism causing tinea sycosis. ČAJKOVAC (15) contributed to the problem of pathogenicity of *T. rubrum*. He described a generalized infection similar to "eczema serpiginosum epidermophyticum" OBRTEL in a 32 year old woman. In that paper ČAJKOVAC extensively commented on clinical lesions due to *T. rubrum* in the light of immunobiological condition of the skin. MILOŠEVIĆ (90) found an epidermophytosis infection in a woman caused by *E. floccosum* covering the infected hair with a sheath of mycelial filaments. The fungus was pathogenic to guinea pigs. Milošević suggested further investigations to elucidate the relationship between *E. floccosum* and other dermatophytes.

---

[1]) VILAS-BOAS NETO & CESAR MARTINS: Ann. Dermatol. Syphiligr. **IV**, 526—537, 1933. — PRIBRAM E.: J. infect. Dis., **V**, 47, 11—15, 1930.

Studying a fungus strain which caused a common herpes on the skin, Milošević & Milovanović (11o) could notice in the inoculated guinea pig a crusted lesion which had microscopically the structure of a typical favus scutulum. The fungus grown on natural media could be indentified as *A. quinckeanum.*

During and after the Second World War, for a certain period of time, a more or less complete stagnation has arisen in research work in mycology, which was instituted in Yougoslavia by the excellent and fundamental work of Milošević [1]).

In a paper dealing with the problem of dermatomycoses in Yougoslavia Grin (35) gave data concerning the incidence of tinea capitis in Peoples Republic of Bosnia and Herzegovina immediately after the Second World War. In the rule, tinea favosa was caused by *A. schoenleini* and trichophytosis by *T. violaceum. Microsporum* infections were not seen at that time in Bosnia and Herzegovina which is in accordance with the opinion expressed at an earlier date by Milošević (104) who was very doubtful about the statement made by Komlik (1937), [2]) that in some areas of Bosnia (Travnik) animal microsporosis may be common. Grin further (35) pointed out the epidemiological importance of pediculi capitis in the spread of tinea capitis by indirect transmission of the causative organism particularly in areas where the disease is endemic.

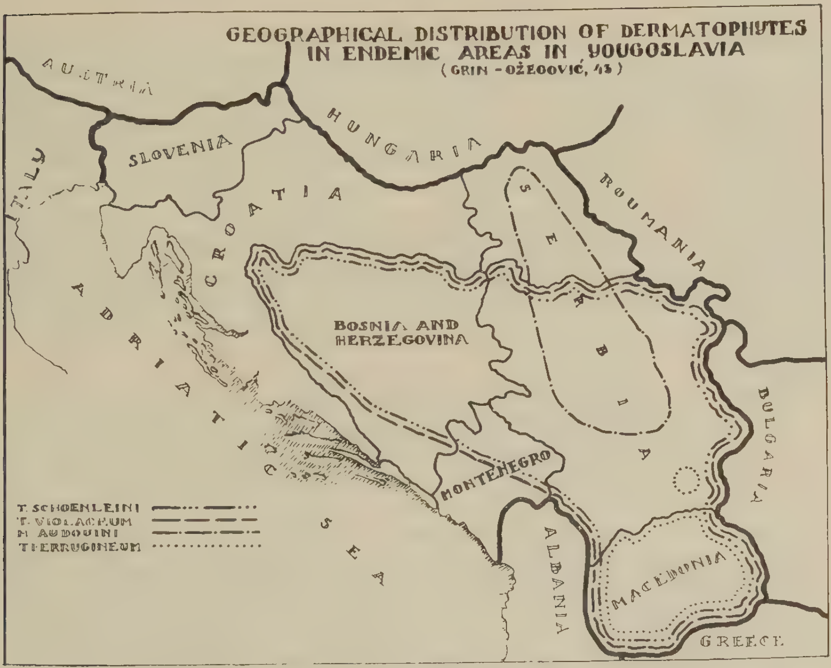
In 1950 Arandjelović (2) published his findings concerning ringworm of the scalp in the district of Belgrade, based on systematic examination of all school children. 5,976 children were examined and he found 309 (5.2 %) infected: 95.5 % due to *T. violaceum*, 1.93 % due to *M. audouini*, 1.64 % due to *T. faviforme album* (in patients belonging to rural areas) and in 0.96 % only to *A. schoenleini*. Interesting is the statement made by Arandjelović that before the II. World War not one original case of tinea favosa could be found in the district of Belgrade. Favus was brought in later, probable by refugies from Bosnia during and immediately after the war. Although Arandjelović had not examined the whole population but children only, the obtained figures gave nevertheless a relatively true picture of the incidence of tinea capitis in the district of Belgrade.

Bril (10, 11) described the campaign against mycotic diseases in the East and South-east of Serbia during the period from 1948 to 1950. BRIL could show that favus is very numerous in that region: of 968 cases of tinea capitis 482 had favus (49.7 %) and 245 (25.3 %) *Microsporum* infections, the rest related to *Trichophyton* infections mostly of endothrix type. From the *Trichophytons* of microide type BRIL found few cases of *T. gypseum* and *T. asteroides* The most interesting part of that paper relates to *Microsporum* infections. BRIL found *M. audouini* in areas (Niš) where tinea capitis due to Microsporums was not known before-an important observation from the epidemiological point of view in respect to the supposed high contagiosity of this infection. Further, BRIL (12) could demonstrate that one part of tinea capitis was caused by *T. ferrugineum*. This is the first description of that organism of Asiatic origin in Yougoslavia.

---

[1]) Prof. Dr. Sima Milošević, after German occupation of Yougoslavia in 1941, left his chair as professor of parasitology on the Medical Faculty in Belgrade and joined, among the first, the partisans in the fight against fascism and for liberation of Yougoslavia. In this fight Prof. Dr. S. Milošević died in the field in 1943.

[2]) Komlik, S.: Mycotic diseases in school-children in the town Travnik, Soc. Med. Pregled, **IX**, 179—182, 1937.


GEOGRAPHICAL DISTRIBUTION OF DERMATOPHYTES
IN ENDEMIC AREAS IN YOUGOSLAVIA
(GRIN - OŽEGOVIĆ, 43)
AUSTRIA
HUNGARIA
ITALY
SLOVENIA
CROATIA
ROUMANIA
SERBIA
BOSNIA AND HERZEGOVINA
ADRIATIC SEA
MONTENEGRO
BULGARIA
ALBANIA
MACEDONIA
GREECE
T. SCHOENLEINI
T. VIOLACEUM
M. AUDOUINI
T. FERRUGINEUM

GRIN gave a review (37) regarding the extent of fungus infections of the scalp in Yougoslavia. The author estimated that about 50000 children are affected mostly in rural areas of less developed parts of the country. ČAJKOVAC (16) described an epidemic spread of tinea capitis in Croatia in the years 1946 and 1947. The epidemic consisted of 67 cases of tinea favosa and 920 of trichophytosis. The epidemic was put very soon under complete control by efficient measures. ČAJKOVAC (18) gave a very interesting report on the material cultured in the Central Mycological Laboratory in Zagreb (see Table 1).

TABLE I.

Incidence of Dermatophytes Observed at Central Mycological Laboratory in Zagreb from 1948—1950

(ČAJKOVAC (18))

DERMATOPHYTES	A G E						%
	0—4	5—9	10—14	15—19	20—70	total	
	m f	m f	m f	m f	m f	m f	
Tr. violaceum	5+15	6+27	0+8	5+2	17+5	103+57	18.90
„ craterif..	1+1	4+0	2+0	0	3+0	10+1	1.30
„ acuminat..	0+2	2+0	1+0	2+1	43+4	48+7	6.50
„ plicatile.	1+0	1+1	2+2	1+0	1+0	6+3	1.00
„ cerebriforme . . .	2+1	3+1	0+1	0	23+1	28+4	3.80
„ ferrugineum . . .	1+2	4+1	1+0	0	0+1	6+4	1.20
„ gyps. mentagrophytes . .	4+4	9+3	6+3	9+8	167+33	195+51	29.00
„ gyps. farinul. . . .	2+1	2+0	5+1	1+0	28+2	38+4	5.00
„ gyps. griseum . . .	0	0	0	0	2+0	2+0	0.25
„ gyps. lacticol. . . .	0	1+0	0	1+1	1+1	3+2	0.60
„ niveum radians . .	1+1	1+0	1+0	2+0	6+2	11+3	1.60
„ rosaceum	0	1+1	2+1	0	5+0	8+2	1.20
„ equinum	0	2+0	0	0	1+1	3+1	0.50
„ rubrum	0	0	1+0	1+1	8+5	10+6	2.00
„ pedis.	0	0	0	0	1+2	1+2	0.50
„ exsiccatum	1+0	1+2	0	0	0	2+2	0.50
„ faviforme /alb. disc. och./ . .	2+1	6+3	6+2	2+1	22+5	38+12	6.00
Ach. Schönleini	3+1	17+8	22+14	6+2	16+3	64+28	10.80
Ep. floccosum	0	0	0+1	2+1	26+5	28+7	4.10
Ach. quinck.	1+0	0+1	2+0	1+1	6+2	10+4	1.60
Ach. gypseum	1+0	3+2	3+1	2+0	6+2	15+5	2.50
Micr. animale	0+1	2+1	2+3	1+1	1+2	6+8	1.60
total	25+30	95+51	96+37	36+19	383+76	635+213	

In that material ČAJKOVAC determined a relatively great number of *M. gypseum* (20 isolates) and *T. ferrugineum* which were mostly originated from Macedonia. Macedonia is situated on the southern part of Serbia where BRIL (10, 11, 12) has isolated the same organism. ČAJKOVAC (19) gave an analogous report at the VI. International Congress of Microbiology in Rome (missing in that report that MILOŠEVIĆ, — 1937 — had also isolated *T. immergens*). From epidemiological point of view it is interesting to note, that ČAJKOVAC at the time of his report was not able to find any isolate of *M. audouini* in western regions of Yougoslavia (Slovenia and Croatia) but *M. gypseum, M. equinum* and *M. canis*. FLEGER (29) gave a survey of isolates found at the Clinic for Skin and Venereal Diseases in Sarajevo:

Table II. (Fleger [29])

1.	A. schoenleini	669	(58.22 %)
2.	F. violaceum	279	(24.28 %)
3.	E. mentagrophytes	64	(5.51 %)
4.	F. album	49	(4.26 %)
5.	T. cerebriforme	37	(3.22 %)
6.	Ep. interdigitale	21	(1.82 %)
7.	Ep. floccosum	10	(0.87 %)
8.	E. niveum	6	(0.52 %)
9.	T. crateriforme	5	(0.43 %)
10.	T. coccinatum	4	(0.37 %)
11.	T. plicatile	2	(0.17 %)
12.	F. glabrum	2	(0.17 %)
13.	T. ochropyraceum	1	(0.08 %)

Out of 1149 isolated samples 58.2 % belonged to *A. schoenleini* (which corresponds to a certain extent to the relative frequency of tinea favosa in Bosnia and Herzegovina). It was, however, surprising he found such a low number of isolates of *T. violaceum* which fact conflicted with the actual very high percentage of the infected population due to this fungus, as Grin, Ožegović & Vasiljević after (39) systematically performed examinations of the whole population proved it in districts where tinea capitis is endemic (7951 cultures were performed and in 61,96 % *T. violaceum* was isolated).

Table III. (Grin, Ožegović & Vasiljević [39])

1.	T. violaceum	4.926	(61.96 %)
2.	A. schoenleini	2.875	(36.17 %)
3.	M. audouini	15	(0.19 %)
4.	T. mentagrophytes	78	(0.98 %)
5.	T. verrucosum	43	(0.54 %)
6.	T. tonsurans	11	(0.13 %)
7.	T. quinckeanum	2	(0.02 %)
8.	T. ferrugineum	1	(0.01 %)

The investigations made by Grin, Ožegović & Vasiljević (39) have covered the population and the livestock in two villages (Tinja and Srebrenik in the district of Tuzla) where 15117 people (96,5 % of total population) and 4376 cattle (98,6 % of the total number) were investigated systematically. The results of these investigations were summed up in five tables, from which here are reproduced 3 (Table IV, V and VI).

The striking feature is the large number of households in the two communities (14.4 % and 20.6 %, respectively) where only der-

Table IV.

Relationship between Frequency of Ringworm of the Scalp and Infection in Cattle

(Grin, Ožegović & Vasiljević (39))

SYSTEMATIC EXAMINATION OF ALL HOUSEHOLDS

Village	Total number of households	Number of the Households in which were infected					
		People only		Cattle only		People and cattle	
		Number	%	Number	%	Number	%
Brezik	51	7	13.7	4	7.8	0	0.5
Crveno Brdo . .	39	4	10.2	3	7.7	0	0
Dragunja . . .	196	22	11.2	6	3.0	0	0
Drapnići	54	3	5.5	3	5.5	0	0
Jasenica	158	26	16.4	5	3.1	1	0.6
Lisovići	130	27	20.8	9	6.9	1	0.7
Osoje	73	10	13.7	0	0	0	0
Podorašje . . .	78	8	10.2	7	9.0	0	0
Podpeć D. . . .	77	14	18.1	3	3.9	2	2.5
Podpeć G. . . .	198	29	14.6	2	1.0	3	1.5
Straža	65	4	6.1	0	0	0	0
Tinja M.	103	20	19.4	8	7.8	0	0
Tinja S.	91	19	20.8	3	3.3	0	0
Zahirovići . . .	81	8	9.8	1	1.2	0	0
Total	1394	201	14.4	54	3.9	7	0.5

matophyte infection of the scalp was found and again the relatively high percentage of households (3.9 % and 5.5 %, respectively) where only cattle had fungus infection; in contrast, there were very few households (0.5 % and 1. %, respectively) where both tinea capitis and ringworm in cattle was present. These results may definitively settle the question regarding the relationship of fungus infection in cattle and favus in human beings as described by Milošević (95, 108, 112) and often quoted in Yougoslav literature. On the basis of these investigations, Grin, Ožegović & Vasiljević (39) were able to demonstrate that there is no correlation between endemic occurence of dermatomycoses of the scalp and ringworm infection in animals. Even in households where at the same time infections in both human beings and aminals were existing, the isolated strains were in the rule mostly not indentical. The authors could demonstrate that the various endemics of scalp infections by dermatophytes in man follow their natural course more or less independently and apart from the infection in cattle, which has an epidemiological development of its own. Human infections caused by zoophilic dermatophytes, which occur among rural population, are as a rule confined to single cases or households only.

TABLE V.

Morbidity of Dermatomycoses of the Scalp in Man and Dermatomycoses in Cattle
(GRIN, OŽEGOVIĆ & VASILJEVIĆ (39))

Village	People					Cattle		
	Total number examined	Favus	Trichophytosis	Total number infected	°/oo	Total number examined	Infected	°/oo
Brezik	234	2	12	14	59.8	72	5	69.0
Crveno Brdo	227	5	2	7	30.8	51	3	50.0
Dragunja	1043	0	39	39	37.4	275	6	21.8
Drapnići	248	0	8	8	32.2	84	3	35.7
Jasenica	902	2	42	44	48.7	257	5	19.4
Lisovići.	748	11	31	42	76.1	190	3	15.7
Osoje.	354	0	22	22	62.1	83	0	0
Podorašje.	420	7	12	19	45.2	171	7	40.9
Podpeć D.	396	5	25	30	75.7	168	4	23.8
Podpeć G.	812	4	52	56	69.9	277	4	14.4
Straža	373	0	6	6	16.0	81	0	0
Tinja M.	506	26	14	40	79.0	211	8	37.4
Tinja S.	467	15	19	33	70.6	128	4	31.2
Zahirovići.	525	3	9	12	22.8	144	1	6.9
Total	7255	80	292	372	51.2	2192	23	24.1

In the disease affecting mainly children the lesions appeared usually on the glabrous skin.

FANINGER (27) published the findings relating to 1226 cases of dermatophyte infections observed in the North-eastern part of Yougoslavia (Banat). It is remarkable that FANINGER found in that region *T. violaceum* as the most common strain beside *M. audouini* and *T. faviforme album*. In few cases only, *T. mentagrophytes* was isolated and in one case *M. felineum*. MILOVANOVIĆ (118) could find in his preliminary investigations in the Peoples Republic of Montenegro *A. schoenleini* and *T. violaceum* in equal numbers and *T. album* in few instances only. FLEGER (30) reported 11 cases of tinea capitis due to *M. audouini* seen at the Clinic for Skin Diseases in Sarajevo and ŠALOMON (132) 8 cases in residents of Bosanska Krajina (frontier between Croatia and Bosnia). It is interesting from the epidemiological point of view that these infections remained confined as single sporadic cases without showing any tendency of expansion. Similar observations were made by GRIN, OŽEGOVIĆ & VASILJEVIĆ (39) and it seems rather difficult to give a proper explanation for this condition. GRIN & OŽEGOVIĆ (43) are close to the concept expressed by VANBREUSEGHEM (personal communication) that *M. audouini* brought in a new region with

TABLE VI.

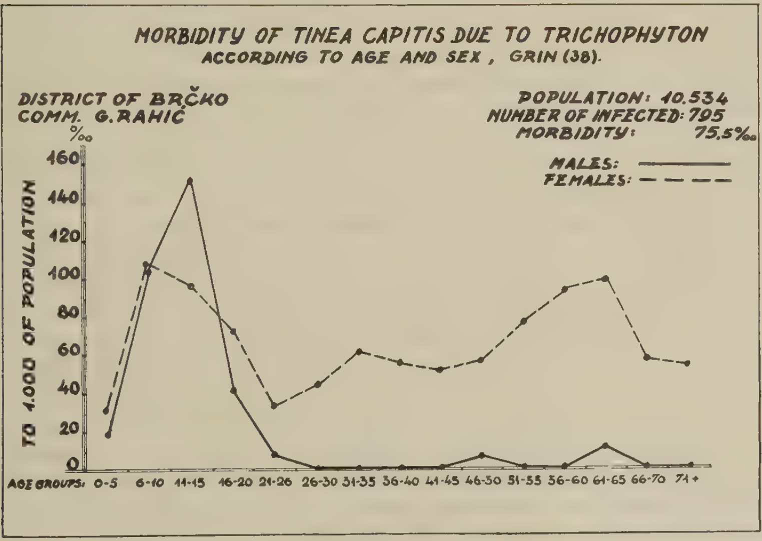
Dermatophytes isolated from Tinea Capitis and Lesions in Cattle
(GRIN, OŽEGOVIĆ & VASILJEVIĆ (39))

Village	People					Cattle			
	Isolated cultures					Isolated cultures			
	Number Isolated	A. Schoenleini	T. Violaceum	T. Mentagrophytes	Total	Number infected	T. Verrucosum	T. Mentagrophytes	Total
Brezik . . .	14	2	12	0	14	5	2	0	2
Crveno Brdo .	7	5	2	0	7	3	2	0	2
Dragunja . .	39	0	38	0	38	6	2	0	2
Drapnići . . .	8	0	8	0	8	3	1	1	2
Jasenica . . .	44	2	39	0	41	5	3	0	3
Lisovići . . .	42	11	31	0	42	3	1	0	1
Osoje	22	0	21	1	22	0	0	0	0
Podpeć D. . .	30	4	22	0	26	4	4	0	4
Podpeć G. . .	56	4	51	0	55	4	4	0	4
Podorašje . .	19	6	11	0	17	7	5	1	6
Straža. . . .	6	0	5	0	5	0	0	0	0
Tinja M. . .	40	25	12	0	37	8	7	0	8
Tinja S. . . .	33	15	17	0	32	4	4	0	4
Zahirovići . .	12	3	8	0	11	1	0	0	0
Total	372	77	277	1	355	53	35	2	37

different ecological conditions may become less contagious than in the primary foci.

Trying to explain the findings made by ČAJKOVAC (18), GRIN, OŽEGOVIĆ & ŠENFELD (42) cultured the material from the patients in Macedonia and could isolate in some instances more than 40% of positive samples *T. ferrugineum*. The authors considered their observations in correlation to those by BRIL (10, 11, 12) and by MILOŠEVIĆ (81), giving a map showing the incidence of different dermatophytes in Yougoslavia. It could be seen that Microsporosis due to *M. audouini* is spreading to Southern regions not farther than to a certain point (Niš), where *T. ferrugineum* starts to appear (probably in endemic form). Neither *M. audouini* nor *T. ferrugineum* could be found until now in the Western region of Yougoslavia besides single, mostly imported, cases. On the contrary, in the North-eastern regions (Vojvodina) *M. audouini* is to be found in endemic form.

GRIN (38) studied the occurence of ringworm of the scalp in adults caused by Trichophytons (*T. violaceum*). His results are based on systematic examination of the whole populations in the antimycotic campaign in Bosnia where tinea capitis is endemic; 117,350 people were examined and 3,026 found infected. GRIN could establish the fact that among a population where the children are found to be affected with ringworm of the scalp caused by *Trichophyton*, analogous affections constantly occur in the adults as well. In the 16—20 year age group 71 % of those affected with the disease were women; the rate, however, rose up to 99 % in the higher age groups. This law governing the spread of the disease which appears to be of great significance for the pathogenesis of ringworm of the scalp caused by *Trichophyton* (*T. violaceum*) was uniform in the whole endemic areas. Further analyses concerning the relationship between the affected family members disclosed the fact that in 69.3 % of the families only the children were affected; in 16.4 % of the infected families both the children and the mother had the disease; in 13.8 % of the affected families only the mother and in 0.5 % only the father was infected. The relatively high percentage of families where only the mother was affected, suggests that the infection found in adults originates as a rule from one occurring in childhood. Concerning the fungi isolated from the scalp of adults *T. violaceum* was found by far the most frequent (91.7 %). Continuing this work, GRIN, ZEC & STERN (41) could demonstrate a sharp fall of infections at puberty in men and a steady, equally high morbidity rate in women with a marked peak in prepuberty and climacteric period (Fig. 1). According to this findings the authors investigated the quantity of excreted androgens and 17-ketosteroids in urin of infected adult patients and could show that the quantity of excreted androgens, using the biologic method, was



smaller than could be proved by this method and that the quantity of 17-ketosteroids-determined colorimetrically- was in average reduced in relation to normal values. In respect to psychosomatic characteristics the great part of the infected male adults had signs of retarded development of the body and an infantile appearence-they were of gracile leptosome constitution and as a rule the span of stretched arms was greater than the height of the body (up to 30 cm). Several infected adult men had somatic alterations which could be considered as characteristic signs of certain dysfunction of hormonal glands, such as lacking of axillary and pubic hair (disturbed adreno-cortical function), and gynecomastia. It was further observed that most of the infected adult men (61 %) had the feminine type of distribution of pubic hair with its horizontal upper border.

Grin (36) brought out the problem of pathogenesis of onychomycoses due to dermatophytes. That paper deals with a group of 2,474 children with tinea capitis belonging to the rural population. Onychomycoses in one or more nails were present in 2.3 % of infected children (3.4 % in favus and 1.3 % in trichophytosis). On the basis of clinical and anamnestical data and experimental investigations Grin could give conclusive evidence that trauma is in the rule an essential condition for the development of nail infection by dermatophytes. This may explain the apparent irregularity regarding the number of affected nails and the place of affection.

Čajkovac (14) discussed the frequency of dyshidrosiform mycoses as seen at the Clinic for Skin Diseases in Zagreb during the years 1928—1937. Breaking down the number of observed cases (405) to the months of beginning of the infection, Čajkovac came to the conclusion that the morbidity rate in the warmest period of the year must not be considered as typical and conditioned by the season because there are of essential importance also other indirect factors (change of mode of life, greater exposure to infection and maceration of the skin, etc.) which are not always of atmospheric nature.

On double infections with dermatophytes reported Milovanović, Nemethy and Grin. Milovanović (113) observed 4 cases with double infections and Nemethy (119) 170 with most frequent combination of *T. violaceum* and *T. ferrugineum* (45 cases), then *T. violaceum* and *T. crateriforme* (23 cases), *E. floccosum* and *A. schoenleini* (17 cases) and *A. schoenleini* and other dermatophytes (16 cases). The author is of the opinion that the number and the site of double infections is depending on immunobiological conditions in loco morbi. Grin (35) noticed 13 cases of simultaneous infections of dermatophytes, the most frequent combination being *T. violaceum* and T. *schoenleini*. Grin (35) as well as Milovanović (113) believe that simultaneous infections are in fact not so rare as it is usually considered and that the existing epidemiological circumstances are of essential importance for this condition.

Čajkovac (21) gave a paper concerning treatment of dermatophytes in general and Schwarzwald (128) concerning x-ray epilation

The relationship between *T. interdigitale* and *T. mentagrophytes* was studied by Fleger (30). He does not share the opinion that *T. interdigitale* is a variety of *T. mentagrophytes* but considers it as a real species. Fleger tried to support this view as followes: a) the macroscopical appearence of *T. interdigitale* in culture is characteristic and easily differentiated from *T. mentagrophytes* (the growth on 10 % pepton-water as suggested by Goetz as well as the Bidault's phenomenon is not of value in the author's experience); b) the growth of *T. interdigitale* on media with sugars is faster than that of *T. mentagrophytes*; c) the fusion of the hyphae between *T. interdigitale* and *T. mentagrophytes* have not been observed by the author and d) the negative affinity of *T. interdigitale* to hair in human lesions and negative results in experimental inoculation in guinea pigs.

Grin & Ožegović (40) described a case of tinea favosa caused by *M. gypseum* and, at that occasion, surveyed the isolates of *M. gypseum* in man published until now in the world literature. Grin & Ožegović succeeded in establishing for the first time in Yougoslav soil the existence of *M. gypseum*. By comparing *M. gypseum* in its saprophytic and parasitic life, Grin & Ožegović were able to demonstrate a marked difference depending on whether the soil was sterile or unsterile. It was found that *M. gypseum* as a saprophyte grows both in sterile and in unsterile soil but in its parasitic state unsterile soil has an inhibitory action. A suggestion was made for a classification of dermatophytes with regard to their biology and ecology into four developmental groups according to their parasitic and saprophytic life, respectively which are pertinent to the pathology of man and animals.

Although great attention was paid to the importance of dermatomycoses of domestic animals in Yougoslavia, there are no relevant publications regarding the spread and types of fungi involved, besides periodical short communications as made by Dankević (24), Sterk (134), Milošević (103), Milovanović (117) and Pantić (122). In this respect, Grin, Ožegović & Vasiljević (39) contributed by the study, already mentioned to the significance of ringworm in cattle for the endemic spread of tinea capitis. Ožegović & Grin (120) recently gave evidence to the question of dermatomycoses in domestic animals in Yougoslavia, especially in Bosnia and Herzegovina. They could ascertain that in some villages the contamination of cattle reached as high as 17.1 %, but in average 4.1 % (district of Tuzla). The most frequent organism was *T. verrucosum* Bodin (93.3 %) and to a much lesser extent, *T. mentagrophytes*. In one case *T. violaceum* could be isolated in a calf. Hajsig (46) reported a case of simultaneous infection in a cow due to *T. verrucosum* and *T. violaceum*. Ožegović (121) has critically evaluated the chapters on mycotic diseases in veterinary textbooks suggesting, for better understanding, uniformity in terms and classification of fungi according to the present mycological achievements.

To the problem of yeasts little attention was paid until now. Apart from the work by MILOŠEVIĆ (71), ČAJKOVAC & PURETIĆ (20) demonstrated a case of generalized candidiasis in a child succesfully treated by injections of candidin, vitamins and blood transfusions. KOSTIĆ (62, 63, 146) reported *Candida albicans* infections after treatment of trichomonas vaginalis with aureomycin and terramycin. *C. albicans* was recorded in 41 women out of 85 so treated. KOGOJ (60) published in extenso a case of generalized candidiasis resembling the clinical picture of dermatitis herpetiformis vegetans. KOGOJ critically considered the etiopathogenesis of dermatitis herpetiformis vegetans in connection with *Candida albicans* infection, which may produce sometimes a similar clinical picture. BEZJAK (148, 149, 150) and FALIŠEVAC & BEZJAK (151), and TOMIĆ-KAROVIĆ & POPADIĆ (147), also contributed to the problem of incidence of moniliasis.

The following authors have until now registered clinical cases of nocardiosis: ČAJKOVAC (17), one case caused by *Streptomyces albus* (WAKSMAN & HENRICI 1943); BRZIN (13), one case due to *N. asteroides* isolated from an abscess located in the brain; KOROŠEC (61) 3 cases, SAVIĆ (126) 3 cases and FLEGER (145), one case. BORDJOŠKI & MILOŠEVIĆ (8) described one case of madura foot caused by *Actinomyces brumptii*. Following LANGERON & MILOŠEVIĆ (68), HAJSIG (45) expressed the view that the term actinomycosis should be confined to fungal infection caused by anaerobic Actinomycetes only. It seems, however, that actinomycosis does not represent a health problem of greater importance in Yougoslavia neither in human (after case reports: 136, 137, 138, 139, 140, 141, 142, 143, 144) nor in veterinary medicine according to the reports of the Institute for pathologic Anatomy at the Veterinary Faculty in Zagreb and of the Veterinary Department of Hygienic Institute in Skoplje (3, 4, 5, 6, 53, 54, 55, 123, 124, 135). SOFRENOVIĆ, MIHAJLOVIĆ & VUČKOVIĆ (130) in their report, regarding frequency and localization of Actinomycosis in cattle, registered from 10,962 slaughtered cattle during the period of 2½ year, 105 suspect cases of which in 30 instances *A. bovis* HARZ was determined. SREDOVIĆ (131) treated a few cases of Actinomycosis in cattle with dihydrostreptomycin with evident good results. ŠIPKA (133) reported a case of mastitis in a cow caused by *C. tropicalis* and HAJSIG & STILINOVIĆ (49) an epizooty of Saccharomycosis in rabbits caused by *S. guttulata*. The authors are of the opinion that hypovitaminosis may produce favorable condition for the development of this organism since secondary manifestations of the infection are disappearing merely after application of vitamin A. During and particulary after World War II epizootic lymphangitis in horses caused by *H. farciminosum* was relatively frequent in Yougoslavia (personal experience), but there are only two reports related to this problem by DAMIANI (23) and DJORDJEVIĆ (26). Aspergillosis in birds and other animals was reported in the annual reports of the Institute for pathologic Anatomy, Veterinary Faculty Zagreb (3, 125). KEŠKO (56) described Aspergillosis in 7 canary birds and SOFRENOVIĆ (129) in a horse.

A great number of authors dealt with reports on and with general elements of medical mycology as MILOŠEVIĆ (92, 98, 99, 100, 106, 107), BARJAKTAREVIĆ & BAJIĆ (7), MILOVANOVIĆ (115, 117), JAKŠA (52), GRIN (35, 37), IGNJATOVIĆ (51) and others.

It may be concluded that, in general, mycological research work in Yougoslavia is progressing, necessitated by mycotic diseases, in the first place, by dermatomycoses which represent in certain parts of the country an important public health problem. The Government is carrying out systematic antimycotic campaigns and research for newer and better technics of treatments in order to put the mycotic diseases in Yougoslavia under full control.

Bibliography

1. ANDJELIĆ B.: Dijagnostika i terapija gljivičnih oboljenja. (Diagnosis and Therapy of Fungous Diseases). Medicinski Pregled, No. 2, p. 49, 1956.
2. ARANDJELOVIĆ A.: Raširenost dermatomikoza u srezu beogradskom. (The Frequency of Dermatomycoses in District of Beograd). Higijena, N. 1/2, p. 21—28, 1950.
3. BABIĆ I.: Aspergiloza kao uzrok ugibanja peradi nakon kastracije. (Aspergillosis as the Cause of the Death in Poultry after Castration). Jugoslavenski Veterinarski Glasnik, p. 30, 1930.
4. BABIĆ I.: Izvještaj Zavoda za patološku anatomiju Veterinarskog Fakulteta u Zagrebu za godinu 1929. (Report of the Institute for pathologic Anatomy of Veterinary Faculty Zagreb for the year 1929). Jugoslavenski Veterinarski Glasnik, p. 196, 1930.
5. BABIĆ I.: Izvještaj Zavoda za patološku anatomiju u godini 1930. (Report of the Institute for pathologic Anatomy in Zagreb for the year 1930). Jugoslavenski Veterinarski Glasnik, p. 98, 1931.
6. BABIĆ I.: Izvještaj Zavoda patološku anatomiju Veterinarskog Fakulteta u Zagrebu u 1931. (Report of the Institute for pathologic Anatomy in Zagreb for the year 1931). Jugoslavenski Veterinarski Glasnik, p. 210, 1932.
7. BARJAKTAREVIĆ N. Sp. & Z. BAJIĆ: Epidermomikoze, favus, mikrosporija, trihofitija. (Epidermomycoses, Favus, Microsporosis, Trichophytosis). Naučna Knjiga, Beograd, 1949.
8. BORDJOŠKI M. & S. MILOŠEVIĆ: Sur un cas de pied de Madura en Yougoslavie produit par une espece nouvelle d' actinomyces, Actinomyces Brumpti n. sp. (On a Case of Madura Foot in Yougoslavia, caused by a new Species of Actinomyces, A. Brumpti n. sp.) Ann. Parasit. hum. comp., **XIII**, 1, 36—51, 1935.
9. BRIL M.: O mikozama, (Mycoses). Niš, 1949.
10. BRIL M.: O mikozama u istočnoj i jugoistočnoj Srbiji. (On the Mycoses in East and South-east of Serbia). Higijena, No. 1/3, p. 85—93, 1949.
11. BRIL M.: O mikozama u istočnoj i jugoistočnoj Srbiji. (On the Mycoses in the East and South-east of Serbia). Medicinski Pregled, No. 6, p. 1/9, 1950.
12. BRIL M.: Trichophyton (Microsporon) ferrugineum u jugoistočnoj Srbiji. (T./M./ferrugineum in the South-east of Serbia). Medicinski Pregled, No. 9/10, p. 32—37, 1951.
13. BRZIN B.: Nocardia steroides. Izolacija iz možganskega abscesa. (N. asteroides. Isolation from a Brain Abscess). Zdravstveni Vestnik, **XXV**, 138—144, 1956.

14. Čajkovac Š.: O frekvenciji dishidroziformnih mikoza. (On the Frequency of dyshidrosiform Mycoses). medicinski Pregled, No. 2, 1939.
15. Čajkovac Š.: Prilog patogenosti trihofiton rubruma. (A Contribution to the Pathogenicity of T. rubrum). Acta med. jugoslav. **II,** 2/3, 175—193, 1948.
16. Čajkovac Š.: Mikoze na teritoriju NR Hrvatske. (Mycoses on the Territory of Province Croatia). Higijena, No. 4, p. 311—319, 1950.
17. Čajkovac Š.: Contribution to the cutaneous streptotrichosis. Acta Dermato-Venerol., **32,** 93—107, 1952.
18. Čajkovac Š.: Dermatomikoze i njihovi uzročnici na teritoriju NR Hrvatske po opažanjima Centralne Mikološke Stanice. (Dermatomycoses and their Causes in Peoples Republ. Croatia). Izvješća Dermatovenerološke Klinike u Zagrebu, p. 7—57, 1952.
19. Čajkovac Š.: Recent Progress in the Study of Human Mycology in Yougoslavia. Extract from Atti del VI Congresso Internazionale di Microbiologia, Vol. 5, Sez. XIV, p. 100—108, Roma 6—12 Septembre 1953.
20. Čajkovac Š. & S. Puretić: Candidiasis granulomatosa. Radovi Medicinskog Fakulteta u Zagrebu, **III,** 245—260, 1953.
21. Čajkovac Š.: Klinika i terapija dermatomikoza. (The Clinic and Therapy of Dermatomycoses). Medicinski Glasnik IX, No. 11/12, p. 398, 1955.
22. Čajkovac Š.: Prilog ambulantnoj dijagnostici dermatomikoza. (Contribution to the ambulatory Diagnosis of Dermatomycoses). Saopćenja "Pliva", 2, god. **III;** 2, 45—56, 1956.
23. Damiani E.: Prikaz liječenja afričke sakagije kirurškom obradom, kausticiranjem fenolom i kemoterapijom živom. (The Treatment of the African Glanders by surgical Treatment, Phenol cauterization and Mercury Chemotherapy). Veterinarski Glasnik, **II,** 261—263, 1948.
24. Dankević V.: Jedan slučaj kišne ekceme na ovcama. (A Case of the rainy Eczema in Sheep). Jugoslavenski Veterinarski Glasnik, No. 7, p. 103, 1923.
25. Djordjević Dj., S. Milošević & R. A. Pavlović: Ispitivanja o fungicidnom dejstvu nekih hemijskih sredstava. (Investigations on the fungicidal Activity of some chemical Agents). Medicinski Pregled, No. 4, 1936.
26. Djordjević Z.: Prilog poznavanju kulturelnih osebina uzročnika afričke sakagije, sa naročitim osvrtom na dobijanje kultura. (Contribution to Knowledge of cultural Properties of African Glanders Agent with special Review of Microcultures). Veterinarski Glasnik, **X,** 4, 275—286, 1956.
27. Faninger A.: Osvrt na problem mikoza u Banatu. (Review on the Problem of Mycoses in Banat). Srpski Arhiv, **LXXXIII.** 11, 128, 1955.
28. Filipović Dj.: Značaj proučavanja životinjskih mikoza u Jugoslaviji. (The Significance of the Study of Animal Mycoses in Yougoslavia). Jugoslav. Veterinarski Glasnik, p. 583, 1936.
29. Fleger J.: Dermatofitska oboljenja Bosne i Hercegovine. (Dermatophytoses in Peoples Republ. Bosnia and Herzegovina). Izvješća Dermatovenerološke Klinike u Zagrebu, p. 63—75, 1952.
30. Fleger J.: Odnos T. interdigitalea prema T. mentagrophytesu. (Relation of T. interdigitale to T. mentagrophytes). Naučno Društvo NR Bosne i Hercegovine, Radovi, Acta **I.,** 225—260, 1953.
31. Fleger J.: Mikrosporija u srednjoj Bosni. (Microsporosis in central Bosnia). Medicinski Arhiv, **XI,** 1—17, 1957.
32. Georgjević & S. Milošević: Aspects cliniques de trichophytie et de favus provoqués par le Trichophyton faviforme album. Distribution de ce dermatophyte en Yougoslavie. (Clinical Aspects of Trichophytosis and Favus caused by T. f. album. Distribution of this Dermatophyte in Yougoslavia). Ann. Parasit. hum. comp., **XIII,** 3, 243—252, 1935.
33. Gilić M.: Mikotična oboljenja. (Mycotic Diseases). Vojno Sanitetski Pregled, No. 5/6, p. 303—305, 1955.
34. Glück L.: Zur Statistik, Ätiologie und Prophylaxe des Kopfgrindes in Bosnien und der Herzegovina. (A Contribution to the Statistics, Etiology and Prophylaxis of Favus in Bosnia and Herzegovina). Jb. Bosn. Herceg. Landespitales 1894—1896, Wien 1896.
35. Grin E. I.: Gljivična oboljenja kose. (Fungous Diseases of Hairs). Medicinski Arhiv, **1,** 1—16, 1948.

36. Grin E. I.: O patogenezi onihomikoza kod favusa i trihofitije. (On the Pathogenesis of Onychomycoses in Favus and Trichophytosis). Higijena, No. 4/5, p. 259—264, 1951.
37. Grin E. I.: O mikotičnim oboljenjima vlasišta u FNR Jugoslaviji. (On the mycotic Diseases of the Scalp in Yougoslavia). Problemi epidemiologije, Zbornik referata sa I. Kongresa Higijeničara, Beograd, 1951.
38. Grin E. I.: Superficijalna trihofitija kod odraslih. (Superficial Trichophytosis in Adults). Radovi Naučnog Društva NR Bosne i Hercegovine, Acta **IV**, p. 23—35, 1956.
39. Grin E. I., L. Ožegović & A. Vasiljević: Značaj dermatofitije goveda za endemičnu raširenost dermatofitija kapilicija. (The Significance of the Ringworm in Cattle for endemic Dermatophyte Infections of the Scalp.) Naučno Društvo NR Bosne i Hercegovine, Acta **VI**, knjiga 3, p. 43—60, 1956.
40. Grin E. I. & L. Ožegović: M. gypseum kao parazit čovjeka i saprofit izoliran iz zemlje. (M. gypseum as Parasite in Man and Saprophyte isolated from the Soil). Naučno Društvo NR Bosne i Hercegovine, Acta **VIII**, knjiga 4, p. 1—12, 1957.
41. Grin E. I., N. Zec & P. Štern: Trihofitija kapilicija odraslih i hormonalna disfunkcija oboljelih. (The Trichophytosis of the Scalp in Adults and hormonal Dysfunction). In press.
42. Grin E. I., L. Ožegović & M. Šenfeld: T. ferrugineum in Peoples Republ. Makedonia. In press.
43. Grin E. I. & L. Ožegović: Današnje stanja mikrosporije u našoj zemlji. (Present Situation of Microsporosis in Yougoslavia). In press.
44. Hajim J.: Nešto o mikozama u našoj armiji. (On the Mycoses in the Yougoslav Army). Vojno Sanitetski Pregled, No. 5, p. 231, 1949.
45. Hajsig M.: Etiologija i mikrobiološka dijagnostika "aktinomikotičnih" oboljenja. (On the Etiology and microbiological Diagnosis of "actinomycotic" Diseases). Veterinarski Glasnik, **VI,** 5, 341—345, 1952.
46. Hajsig M.: Simultana mikoza s T. verrucosum var. album i T. violaceum u goveda. (A simultaneous Mycosis due to T. verrucosum and T. violaceum in Cattle). Veterinarski Arhiv, **XXVII,** 7/8, 235—239, 1957.
47. Hajsig M.: T. verrucosum (Bodin 1902) u goveda na području NR Hrvatske. (T. verrucosum in Cattle on the Territory of Province Croatia). Veterinarski Arhiv, **XXVII,** 9/10, 315—322, 1957.
48. Hajsig M. & Z. Stilinović: Zapažanja o saharomikozi kunića. (On Saccaromycosis in the Rabbit). Veterinarski Arhiv, **XXVI,** 3/4, 81—85, 1956.
49. Hajsig M.: Torulopsis apicola isolated from Bees. In press.
50. Ignjatović B.: Borba protiv mikoznih oboljenja u NR Srbiji. (The Campaign against mycotic diseases in Province Serbia). Glasnik Hig. Instituta NR Srbije, No. 1, p. 80, 1952.
51. Ignjatović B.: Akcija protiv mikoznih oboljenja u NR Srbiji. (The Action against mycotic Diseases in Peoples Republ. Serbia). Narodno Zdravlje, p. 246—252, 1955.
52. Jakša J. :Kožne plesni. (Mycoses of the Skin). p. 63, Ljubljana 1957.
53. Ježić J.: Važniji podaci iz godišmjeg izvještaja Veterinarskog odsjeka Higijenskog Zavoda u Skoplju. (Some important Data from the Annual Report of Veterinary Department of Hygienic Institute in Skoplje). Jugoslavenski Veterinarski Glasnik, 4, p. 87, 1928.
54. Ježić J. Iz godišnjeg izvještaja Veterinarskog Odsjeka Higijenskog Zavoda u Skoplju. (From the Annual Report of Veterinary Department of Hygienic Institute in Skoplje, for the year 1928). Jugoslavenski Veterinarski Glasnik, p. 69, 1929.
55. Kenda I.: Bolesti vimena kod krava zaklanih na zagrebačkoj klaonici sa naročitim osvrtom na njihove uzročnike. (The Diseases of the Udder in Cows slaughtered in the Slaughterhous Zagreb with special Attention to their Agents). Jugoslavenski Veterinarski Glasnik, p. 145, 1929.
56. Keško E.: Aspergiloza kanarinaca. (Aspergillosis in Canary Birds). Jugoslavenski Veterinarski Glasnik, p. 239, 1935.
57. Kićevac & S. Milošević: Aspects cliniques de favus provoqués par le "T.

faviforme album". (Clinical appearences of Favus caused by T. f. album). Bull. Soc. franç. Dermat. Syphilog., No. 3, 1936.

58. Kogoj F.: Experimentelle Beiträge zur Lehre von den Dermatomykosen mit besonderer Berücksichtigung der Lokalisationsbestimmung hämatogener Infektionen. (Experimental Contributions to the knowledge of Dermatomycoses with special Attention to the Localization of hematogen Infections). Arch. Derm. Syph. Wien, **150,** 333—355, 1926.

59. Kogoj F.: Eksperimentalni doprinos nauci o dermatomikozama. (An experimental Contribution to the knowledge of Dermatomycoses.) Liječnički Vjesnik, **L,** 225—234, 1928.

60. Kogoj F.: Generalizirana kandidijaza nalik na vegetirajući herpetiformni dermatitis. (Generalized Candidiasis simulating Dermatitis herpetiformnis vegetans.) Rad, **307,** 5—18, 1955.

61. Korošec M.: Lečenje aktinomikoze penicilinom. (The Treatment of Actinomycosis with Penicillin.) Medicinski Pregled, No. 7, p. 155—157, 1949.

62. Kostić P.: Značaj M. albicans u oboljenjima urogenitalnog trakta žene. (The Significance of M. albicans in Diseases of the urogenital Tract of Women.) Srpski Arhiv, p. 254—265, 1953.

63. Kostić P.: Pojava M. albicans kao "sporednog efekta" pri lečenju kolpita trichomonas vaginalis antibioticima aureomicinom i teramicinom. (The appearence of M. albicans as the "side effect" in the Course of Treatment of Trichomonas vaginalis colpitis with Antibiotics: Aureomycin and Terramycin.) Srpski Arhiv, **LXXXII,** sv. 1, p. 19—29, 1954.

64. Langeron M. & S. Milošević: Morphologie des dermatophytes sur les milieux à base de polysaccharides. Note preliminaire. (Morphology of Dermatophytes on natural Media and Media based on polysaccharids. Preliminary report.) Ann. Parasit. hum. comp. **VIII,** 3/4, 422—436, 1930.

65. Langeron, M. & S. Milošević: Morphologie des dermatophytes sur les milieux naturels et milieux à base de polysaccharides. Essai de classification. Deuxième mémoire. (Morphology of Dermatophytes on naturel Media and Media based on polysaccharids. An Attempt of Classification. Second note.) Ann. Parasit. hum. comp. **VIII**, 5, 1930.

66. Langeron M. & S. Milošević: Les nouvelles méthodes d'étude des dermatophytes. (New Methods for Study of Dermatophytes.) Sexta reunion de la Sociedad Argentina de Patologia Regional del Norte Salta, 29 y 30 Sept. y 1 Oct. de 1930.

67. Langeron M. & S. Milošević: Alergija i imunitet kod dermatofitija. (Allergy and Immunity in Dermatophytoses.) Medicinski Pregled, No. 3, 1933.

68. Langeron M. & S. Milošević: Današnje stanje pitanja aktinomikoze. (Present State of the Problem of Actinomycosis. A critical survey.) Medicinski Pregled, No. 12, 1936.

69. Langeron M. & S. Milošević: Sur une methode employée par Acton et Dey pour regénérer les cultures pleomorphisées des dermatophytes. (On a Method used by Acton and Dey for the Regeneration of the pleomorphic Cultures of Dermatophytes.) Ann. Parasit. hum. comp. **XV,** 2, 177—181, 1937.

70. Martinčić M.: Izvještaj o radu Zavoda za patološku anatomiju Veterinarskog Fakulteta u Zagrebu u godini 1932/33. Report on the Activity of the Institute for pathologic Anatomy-Veterinary Faculty in Zagreb for the year 1932/33.) Jugoslavenski Veterinarski Glasnik, p. 234, 1934.

71. Milošević S.: Das Wachstum und die Wachstumsformen des Soorpilzes auf verschiedenen Nährboden, besonders auf solchen die mit Extrakten aus Körperorganen hergestellt wurden. (The Growth and the Growth forms of the Thrush- fungus on different Media, esp. on those made with Extracts from body Organs.) Zbl. Bakt. (2. Abt.) **114,** 174—185, 1929.

72. Milošević S.: Nova tehnika za proučavanje dermatofita. (A new Technic for the Study of Dermatophytes.) Reprint from the III. Allslavian Medical Congress, held in Split from the 5-8 October in 1930.

73. Milošević S.: Nova tehnika za proučavanje dermatofita. (A new Technic for the Study of Dermatophytes.) Medicinski Pregled, No. 10, 1930.

74. Milošević S.: Novi pogledi na grupu dermatofita. (New Aspects regarding Dermatophytes.) Medicinski Pregled, No. 11, 1930.

75. Milošević S.: Das Verhalten des Timotheebazillus unter der Einwirkung von Aspergillusfiltrat. (The Behaviour of B. Timothee under the Action of Aspergillus filtrate.) Zbl. Bakt. (2 Abt.) **118,** 1701—1722, 1930.

76. Milošević S.: Sur un cas de trichophytie produit par une espèce nouvelle de trichophyton, T. langeroni n. sp. (On a Case of Trichophytosis caused by a new Species of Trichophyton, T. langeroni n. sp.) Ann. Parasit. hum. comp., **IX,** 5, 456—461, 1931.

77. Milošević S.: Jedan slučaj trihofitije izazvan novom vrstom trihofitona, T. langeroni n. sp. (A case of Trichophytosis caused by a new Species of Trichophyton, T. langeroni n. sp.) Medicinski Pregled, No. 7, 1931.

78. Milošević S.: Problem nemaljastih kultura. (The Problem of glabrous faviform Cultures.) Medicinski pregled, No. 7, 1931.

79. Milošević S.: Pčelinji med kao zamena šećera u Sabouraudovim podlogama. (Honey as Substitute for Sugars in Sabouraud's Media.) Medicinski Pregled, No. 7, 1931.

80. Milošević S.: Da li gljive iz roda alternaria mogu da proizvedu tineu? (Are Fungi of Genus Alternaria able to cause Tinea capitis?) Medicinski Pregled, No. 12, 1931.

81. Milošević S.: 100 slučajeva dermatomikoza u Jugoslaviji. (100 Cases of Dermatomycoses in Yougoslavia.) Medicinski Pregled, No. 10, 1932.

82. Milošević S.: T. faviforme album kao uzročnik jednog slučaja favusa kapilicija (T. f. album as the Cause of a Case of Favus of the Scalp.) Medicinski Pregled, No. 10, 1932.

83. Milošević S.: Povodom jedne mikoze nokata. (Case of Onychomycosis.) Medicinski Pregled, No. 11, 1933.

84. Milošević S: T. faviforme album kao uzročnik jednog slučaja favusa kapilicija. (T. faviforme album as the Cause of Favus of the Scalp.) Glasnik Centr. Hig. Zavoda, **IX,** knj. XVII, No. 1/3, 1934.

85. Milošević S.: Contribution à l'étude du T. persicolor. (Contribution to the Study of T. persicolor.) Ann. Parasit. hum. comp., **XII,** 4, 289—295, 1934.

86. Milošević S.: Diagnostic microscopic des teignes de la peau glabre. (Microscopical Diagnosis of Tinea corporis.) Ann. Parasit. hum. comp., **XII,** 5, 1934.

87. Milošević S.: Pojava mikrosporije u našoj zemlji. (Microsporosis in our Country.) Medicinski Pregled, No. 7, 1934.

88. Milošević S.: Contribution à l'étude du T. rubrum. (Contribution to the Study of T. rubrum.) Ann. Parasit. hum. comp., **XII,** 3, 253—258, 1935.

89. Milošević S.: Une nouvelle espèce pathogene de ctenomyces, Ct. bossae n. sp. (A new Species of the pathogenic Ctenomyces, Ct. bossae n. sp.) Ann. Parasit. hum. comp., **XIII,** 6, 559—566, 1933.

90. Milošević S.: Prilog proučavanju E. floccosum. (Contribution to the Study of E. floccosum). Medicinski Pregled, No. 9, 1935.

91. Milošević S.: O zadacima parasitologije u našoj zemlji. (The Significance of Parasitology in our Country.) Medicinski Pregled, No. 1, 1936.

92. Milošević S.:Mikroskopska dijagnoza dermatofitija na goloj koži. (Microscopical diagnosis of Dermatophytoses of glabrous Skin.) II. report. Medicinski Pregled, No. 3, 1936.

93. Milošević S.: Pokušaj sinteze u grupi dermatofita. (An Attempt of Synthesis of the Groups of Dermatophytes.) Medicinski Pregled, No. 10, 1936.

94. Milošević S.: Über eine vereinfachte Färbungsmethode zur Darstellung von Fadenpilzen in Schuppen und Haaren in der ambulanten Praxis. (On a simplified staining Method for Determination of Fungi in the ambulatory Practice.) Dermat. Wschr. **102,** 11, 320—322, 1936.

95. Milošević S.: Novi pogledi na etiologiju favusa kod čovjeka. (New Aspects on Etiology of human Favus.) Medicinski Pregled, No. 5, 1937.

96. Milošević S.: O klasifikacijama dermatofita. (Classifications of Dermatophytes.) Liječnički Vjesnik, 59, No. 2, p. 1—12, 1937.

97. Milošević S.: Une nouvelle espèce de Trichophyton megaspore à culture glabre. (A new Species of Trichophyton — megaspore with glabrous Culture. T. immergens n. sp.) Extrait des C. R. Soc. Biol. Paris **CXXIV,** 469, 1937.

98. Milošević S.: Koje podloge treba upotrebiti za proučavanje dermatofita.

(Which Media should we use for the Study of Dermatophytes.) Glasnik Centr. Hig. Zavoda, knj. **XX**, sv. 2, p. 85—94, 1937.

99. Milošević S.: Vrednost prirodnih podloga za proučavanje dermatofita. (The Value of natural Media for Study of Dermatophytes.) Glasnik Centr. Hig. Zavoda, knj. **XXI**, sv. L, p. 41—48, 1938.

100. Milošević S.: Socijalno medicinski značaj dermatofitija. (The social and medical Significance of Dermatophytoses.) Soc. Med. Pregled, X, juli-august-septembar, p. 247—254, 1938.

101. Milošević S.:Dermatofitije. (The Dermatophytoses.) Glasnik Centr. Hig. Zavoda, **XXI**, sv. 3/4, p. 275—296, 1938.

102. Milošević S.: T. immergens et ses manifestations cliniques. (T. immergens and its clinical Manifestations.) Mycopathologia, **I**, 2, 88—97, 1938.

103. Milošević S.: Dermatophyties et lutte contre ses affections en Yougoslavie. (The Dermatophytes and the Fight against their Affections in Yougoslavia.) Office Internaz. d'Hygiene Publ., Bull. Mens. **XXX**, 10, 2333—2341, 1938.

104. Milošević S.: Mikotična oboljenja kod djece školske u gradu Travniku i njegovoj okolini. (Mycotic Diseases in the School-children in Travnik and its Surroundings.) Soc. Med. Pregled, **XI**, 55—58, januar-februar-mart 1938.

105. Milošević S. & V. Ekersdorf: Lesions pilaires dans les teignes experimentales produits par les cultures pleomorphiques des dermatophytes. (Hair Lesions in the experimental Tineae caused by pleomorphic Cultures of Dermatophytes.) Extrait des C. R. Soc. Biol., Belgrade, **CXXVII**, 1369, 1931.

106. Milošević S. & V. Ekersdorf: Tri praktična instrumenta za uzimanje i sejanje materijala kod dermatofitija. (Three practical Instruments for taking and inoculating Material in Dermatophytoses.) Medicinski Pregled, No. 1, 1932.

107. Milošević S. & V. Ekersdorf: Naši postupci pri uzimanju, posmatranju i sejanju materijala kod dermatofitija. (Our Methods in taking, observing and inoculating material in dermatophytoses.) Medicinski Pregled, No. 1, 1935.

108. Milošević S. & M. Milovanović: Prilog poznavanju favusa u našoj zemlji. (Contribution to the Knowledge of Favus in our Country.) Medicinski Pregled, No. 4, 1935.

109. Milošević S. & A. Simić: Uticaj beta i gama zrakova radona na pojavu pleomorfizma kod dermatofita. (The Influence of beta and gamma Rays on the Appearance of Pleomorphism in Dermatophytes.) Medicinski Pregled, No. 4, 1936.

110. Milošević S. & M. Milovanović: Prilog proučavanju mišjeg favusa kod čovjeka. (Contribution to the Study of Mouse-favus in Man.) Medicinski Pregled, No. 10, 1940.

111. Milošević S. & J. Suhačeva: Pojave pleomorfizma kod kultura Ct. asteroides na Sabouraudovim podlogama sa dodatkom trihofitina. (The Appearance of Pleomorphism in Cultures of Ct. asteroides on Sabouraud's Media with addition of Trichophytin.) Medicinski Pregled, No. 8, 1939.

112. Milošević S. & J. Suhačeva: Prilog proučavanju etiologije humanog favusa. (Contribution to the Etiology of human Favus.) Medicinski Pregled, No. 1., 1937.

113. Milovanović M.: Dvostruka infekcija dermatofitima. (Double infection with Dermatophytes.) Medicinski Pregled, No. 1, 1937.

114. Milovanović M: Favus kod novorodjenčeta. (Favus in a new-borne Child.) Medicinski Pregled, No. 4, 1937.

115. Milovanović M.: Dermatomikoze i mere za njihovo suzbijanje. (Dermatomycoses and Measures for their Eradication.) Narodno Zdravlje, No. 7/8, p. 61—64, 1948.

116. Milovanović M. & S. Vukobratović: Prilog poznavanju blastomikoza. (A contribution to the Knowledge of Blastomycoses.) Medicinski Glasnik, No. 1, p. 33, 1951.

117. Milovanović M.: Značaj medicinske mikologije za našu zemlju. (The Significance of medical Mycology for our Country.) Glasnik Hig. Instituta, sv. 4, p. 249—256, 1953.

118. Milovanović M.: Dermatomikoze i njihovi uzročnici u ivangradskom srezu. (Dermatomycoses and their Causes in the District of Ivan-Grad.) Medicinski Zbornik, 5. p. 49—54, 1955.

119. Nemethy M.: O simultanim mikozama, izazvanim patogenim dermatofitima. (Simultaneous Mycoses caused by pathogenic Dermatophytes.) Izvješća Dermatovenerološke Klinike u Zagrebu, p. 79—87, 1952.

120. Ožegović L.: Dermatofiti i njihova obrada u veterinarskim udžbenicima. (Dermatophytes in veterinary Textbooks.) In press.

121. Ožegović L. & E. I. Grin: Dermatomikoze domaćih životinja u našoj zemlji, s posebnim osvrtom na njihovu raširenost u NR Bosni i Hercegovini. (Dermatophytoses in domestic Animals in our Country, with special Attention to their Extension in Provinces Bosnia and Herzegovina.) Veterinaria, **VI**, No. 2/3, 1957.

122. Pantić V.: Promene u koži kod dermatomikoza konja. (Skin Lesions of Dermatomycoses in Horses.) Acta Veterinaria, V, 1, 45—52, 1955.

123. Plasaj S.: Izvještaj o poslovanju Zavoda za nauku o zarazama Veterinarskog fakulteta u Zagrebu u šk. god. 1927/28. (Report on the Activity of the Institute for the Infectious Diseases of Vet. Fac. Zagreb for 1927/28.) Jugoslavenski Veterinarski Glasnik, p. 69, 1929.

124. Plasaj S.: Izvještaj o poslovanju Zavoda za nauku o zarazama Vet. Fak. u Zagrebu u šk. god. 1928/29. (Report on the Activity of the Institute for Infectious Diseases of Vet. Fac. in Zagreb for 1928/29.) Jugoslavenski Veterinarski Glasnik, p. 31, 1930.

125. Plasaj S. & I. Tomašec: Prinos k patologiji purića. (Contribution to the Pathology of young Turkeys.) Jugoslavenski Veterinarski Glasnik, p.216, 1931.

126. Savić A.: Prilog proučavanju aktinomikoznih oboljenja. (A contribution to the Knowledge of actinomycotic Diseases.) Vojno Sanitetski Glasnik, **VI**, p. 369—371, 1949.

127. Schwarzwald M.: O prolaznoj epilaciji vlasišta glave. (Temporary Epilation of the Scalp.) Izvješća Dermatovenerološke Klinike u Zagrebu, p. 89—96, 1952.

128. Simić A. & S. Milošević: Uticaj beta i gama zrakova radona na kulture dermatofita. (The Influence of beta and gamma Rays on Cultures of Dermatophytes.) Radiološki Glasnik, **2**, No. 1/2, 1938.

129. Sofrenović Dj.: Aspergiloza pluća sisara. (Aspergillosis of the Lung in Mammalians.) Veterinarski Glasnik, **II**, 410—414, 1948.

130. Sofrenović Dj., B. Mihajlović & K. Vučković: Aktinomikoza goveda — etiologija i lokalizacija procesa. (Actinomycosis in Cattle — etiology and the Localization of the Lesions.) Veterinarski Glasnik, **X**, 1, 801—821, 1956.

131. Sredović S.: Lečenje aktinomikoze goveda streptomicinom. (Treatment of Cattle Actinomycosis with Streptomycin.) Veterinarski Glasnik, **X**, 7, 522—523, 1956.

132. Šalomon T.: Prvi slučajevi dermatofitije izazvani sa M. audouini u Bosanskoj Krajini. (First Cases of Dermatophytosis in B. Krajina caused by M. audouini.) Medicinski Arhiv, **X**, 2, 63—67, 1956.

133. Šipka M.: Candida tropicalis kao uzročnik mastita kod krava. (C. tropicalis as the Cause of Mastitis in Cows.) Veterinarski Glasnik, **XI**, 8, 747—750, 1957.

134. Šterk V.: Izvještaj o radu Veterinarskog Odjeljenja Higijenskog Zavoda u Skoplju za 1938. (Report on the Activity of Veterinary Department of Hygienic Institute Skoplje in 1938.) Jugoslavenski Vet. Glasnik, p. 258, 1939.

135. Winterhalter M.: Razudbeni nalazi kod uginulih goveda razudjenih u Zavodu za patološku anatomiju Veterinarskog Fakulteta u Zagrebu utoku 1928—1938. (Findings in Cattle dissected in Institute for pathologic Anatomy of Veterinary Faculty Zagreb in the Course of the years 1928—1938.) Jug. Vet. Glasnik, p. 357, 1939.

136. Čupar I.: Terapija aktinomikoze. (The Treatment of Actinomycosis). Liječnički Vjesnik, **54**, 610—613, 1932.

137. Djoković L. & R. Djordjević: Aktinomikoza lica i vilica. (The Actinomycosis of the Face and Maxillae.) Srpski Arhiv, **84**, 251—256, 1956.

138. Jovičić D. M.: Jedan slučaj aktinomikoze grudnog koša. (A Case of Thorax Actinomycosis.) Srpski Arhiv, **26**, 170—171, 1955.

139. Korošec M.: Aktinomikoza in penicilin. (Actinomycosis and Penicillin). Zdravstveni Vestnik, **18**, 33—36, 1949.

140. Lukić D. & Radović P.: Aktinomikoza genitalnih organa žene. (Actinomycosis of Genital Organs of Women.) Srpski Arhiv, **81**, 406—410, 1953.

141. Murić M.: Slučaj pleuropulmonalne aktinomikoze. (A Case of Pleuropulmonal Actinomycosis.) Srpski Arhiv, **48,** 339—342, 1950.

142. Pavletić I.: Abdominalna aktinomikoza. (Abdominal Actinomycosis.) Vojno Sanitetski Pregled, **11,** 78—89, 1954.

143. Rašević L. & Dj. Vasiljević: Slučaj uspješno lečene aktinomikoze abdomena. (A Case of successfully treated Abdominal Actinomycosis.) Srpski Arhiv, **80,** 504—509, 1952.

144. Žumer M.: Zdravljenje pljučne aktinomikoze. (Recovery of the Lung Actinomycosis.) Zbornik Kirurgične Klinike v Ljubljani ob desetnici. Ljubljana, 1950, p. 94—98.

145. Fleger J.: Erysipeloid Rosenbach izazvan Nocardiom. (Erysipeloid Rosenbach caused by a Nocardia.) Medicinski Arhiv, **1,** 32—34, 1947.

146. Kostić & Šulović: Lečenje mikotične infekcije urogenitalnog aparata žene. (Treatment of mycotic Infection of Urogenital Tract of Women.) Medicinski Glasnik, **9,** 125—131, 1955.

147. Tomić-Karović M. & V. Popadić: Mittelohrentzündungen verursacht durch C. albicans. (Inflammation of the inner Ear caused by C. albicans.) Schweiz. med. Wschr., **83,** 59—61, 1953.

148. Bezjak V.: Osjetljivost uvjetno patogenih kandida prema nistatinu in vitro. (In Vitro Sensitivity of Potentially Pathogenic Candida Species to Nystatin.) Higijena, **VIII,** 4, 269—272, 1956.

149. Bezjak V.: Levuriformni miceti izolirani kod bolesnika u Zagrebu. (Levuriform Mycetes Isolated from patients in Zagreb.) Radovi Medicinskog Fakulteta u Zagrebu, **I,** 1953.

150. Bezjak V.: Incidence of Yeast-like Fungi in oral Cavity. Acta med. jugoslav. **VIII,** 2, 200—204, 1954.

151. Fališevac J. & Bezjak V.: Monilijaza kao posljedica terapije antibioticima. (Moniliasis as the Sequelae of the Therapy with Antibiotics.) Medicinski Glasnik, **8,** 48—50, 1954.

STEPHEN BALLAGI
(1893—1955)

OBITUARY

STEPHEN BALLAGI

(1893—1955)

In spite of his long lasting disease, the death of Professor STEPHEN BALLAGI was an unexpected event for his friends and for the Hungarian dermatologists. He was born in 1893, thus, he left us too early at the age of 62 years. He began his university work as a young physician in the University Clinic for Skin- and Venereal Diseases at Budapest. His inclination to science was a tradition in his family, because his grandfather was professor of theology and member of the Hungarian Academy of Sciences, his father was professor of history and also Rector Magnificus of this university. It was by these traditions that he was attached to this university as its devoted servant. As early as in the first years of his studies he was attracted by experimental work. At this time, he started with the study of mycologic problems and he became soon the leader of the mycologic laboratory of the Clinic, which he had reorganized and made well known by his work. When he started his work at the Clinic this branch of dermatology was hardly cultivated in our country, and so he had to approach it by a new pathway. As a follower of the great Hungarian mycologist, DAVID GRUBY he was one of the first scientists engaged in methodical mycology in this country. It is his unforgettable merit that he gave others his abundant experience collected by the difficult work of long years. In this way he made a great contribution to the development of Hungarian mycology created first of all by his work.

Beside this, he participated in the official life of dermatology. He was one of the founders of the Hungarian Dermatological Society, later he became secretary, then general secretary of the same Society. He was also general secretary of the IXth International Dermatological Congress held in 1935 at Budapest. For this Congress he collected an unparalleled mycologic material which was at that time one of the greatest fungus collection in the entire world. In the Corpus Iconum Morborum Cutaneorum edited by the Congress, 398 photos were published from this collection. Among these the cultures of 310 different strains were presented. Aside from his unforgettable personality and his papers published here and abroad, the first Hungarian Textbook on Dermato-Mycology is a valuable piece of his legacy. His work was in the field of mycology manyfold. He described a new fungus strain (*Tr. nigrum*) and first in this country acremoniosis. He was concerned with the mycosis of nails caused by *Scropulariopsis brevicaulis*, and with the problem of mycids. As for the latter, he demonstrated by culture that in the mycids arising by a hematogenous route fungus elements also may be present. He studied the pathogenic role of common moulds and demonstrated their affinity to the cutaneous tissue rather than to the epidermis. He had a prominent part in the organization of the prevention of fungus diseases, and in the practical achievement of this work. Later he was appointed as chief of the department of dermatology to a hospital. He continued, however, as head of the mycologic laboratory of the Clinic. While taking leave from this prominent personality of the official life of Hungarian dermatology, we felt that our loss was irreparable.

To take leave from the friend was harder than the official farewell. He was generally beloved by his co-workers, and everybody who was acquainted with him. We were working for many years at neighboring laboratory tables and were associated in life and profession for several decades. He was, as I saw him, always cheerful and unwearied. He was attached as a friend to everybody. His humane behaviour never wavered and never changed. He remained a man and a friend to everybody under all circumstances, as a faithful possessor of the high thoughts bequested to him by the home of the parents. In last years he came rarely to see us, because of his disease. Yet, his old spirits were always present and he was always ready to help others. It was by these humane and medical qualities that he was highly esteemed, his friends were so deeply attached to him and these qualities will preserve his memory.

Clinic for Skin and Venereal Diseases
Medical Faculty, University of Budapest F. FÖLDVÁRI

LIBRI NOVI

FONSECA, JOSÉ BONIFÁCIO: *Blastomicose Sul-Americana. Estudo das Lesões Dentárias e Paradentárias sob o Ponto de Vista Clinico e Histopatológico.* São Paulo, 1957. (South-American Blastomycosis. Investigations of dental and paradental lesions from clinical and histopathological point of view.) 182 pages, 20 plates in black and white. Paper. (Portuguese).

This monograph, in its mycological studies, originated in the Mycological Center of the Medical Faculty of the University of São Paulo, under the guidance of the outstanding Brazilean mycologist, Prof. CARLOS DA SILVA LACAZ. To understand the importance of these investigations, one has to know that the Brazilean (better: South-American) blastomycosis (Paracocidioidal granuloma) ranges in its importance as a public health problem along with syphilis and tuberculosis. This work serves a dual purpose. It adds important details to the etiology and pathogenesis of this most devastating form of a deep seated fungus infection, on one hand, and shows the way how the dental surgeon holds the first line of defense by the early detection of the infection in the oral cavity, on the other. In eight chapters the author ably discusses, based mainly on his own investigations, the etiology, pathogenesis, medico-social significance of the condition, always with special reference to the oral cavity as the main portal of entry of the infection. Dental and paradental structures are most thoroughly considered in the discussion. The black and white plates bring excellent and instructive, well selected illustrations, adding a great deal to the value of the text. Despite the fact that Paracoccidioidal granuloma is restricted to a continent, although rampant it is about to spread all over South America, these investigations have a great significance by enlarging our knowledge in geographical pathology. The monograph should interest the dental surgeon, the dermatologist, the otolaryngologist and, last but not least, the medical mycologist. This work shows at the same time the high level of mycological research in Brazil. The make-up of the book, as to paper, print, quality of illustrations is excellent. There is a thorough bibliography added. The author can be congratulated for this erudite work.

TIBOR BENEDEK

LACAZ (CARLOS DA SILVA): *South American Blastomycosis.* — An. Fac. Med. S. Paulo, 39, 120 pp., 1 col. pl., 44 fig., 1956. (31-page bibliogr.)

The author is well known for his fundamental contribution to the knowledge of this endemic fungus infection of the most serious character. In this concise monograph in English he wants to make available the extensive knowledge accumulated on the subject in the South American, particularly Brazilean, literature for the students of other countries who are not in command of Portuguese. The reader may wonder, outside Brazil, why he should have a thorough information on a disease which mainly (in the past exclusively) occurs in Brazil. The student of medical mycology should know, of course, about this most devastating fungus infection and its causative organism. It is all the more indicated nowadays, because this disease is not confined anymore to Brazil alone but spreading slowly but surely to other parts of South America. On account of the swift communication it may easily reach also other parts of the world. As an evidence it should be mentioned that PERRY et al. already reported the first case of this disease found in the United States in 1954 (Arch. Dermat. & Syph. 70 : 477). The author discusses in subsequent chapters the history, geographic distribution, mycology, source of infection, clinical forms of the disease, Lôbo's disease (keloidal blastomycosis), differential diagnosis, pathology, treatment and control of cure. The black and white clinical, mycological, histopathological illustrations are most instructive. Bibliography is exhaustive. This excellent monograph belongs to the library of every mycologist, dermatologist and otolaryngologist. It is highly recommended.

TIBOR BENEDEK

ROTHSTEIN, JEROME: *Communication, Organization and Science.* The Falcon's Wing Press, Indian Hills, Colorado, 1958. 110 pp. Price: $ 3.50.

Communication and measurement, the two elements on which science is built, have led to the concepts of entropy and organization as well as to the distinctly modern field of cybernetics. In this important study the author shows that measurement and communication have the same underlying logical structure. He investigates the consequences of their close relationsship to modern conceptions of entropy and organization. Dr. MUSES' brilliant foreword brings a creatively critical dimension to JEROME ROTHSTEIN'S valuable concepts and introduces a radically new yet naturally related approach — that of chronotopology — to problems of the organization, analysis and interaction of events biological, psychological and physical.

TIBOR BENEDEK

BARNETT, H. L.: *Illustrated Genera of Imperfect Fungi.* Burgess Publishing Co. 426 South Sixth Street, Minneapolis 15, Minn. 1956. Second printing, paper, ring binder, 218 pages. Price $ 4.-

The economic importance of the imperfect fungi in agriculture, industry and medicine and the frequency with which they are encountered make it highly important that the student of mycology learns to recognize many genera and species of this group. For this goal this manual is intended to be one of many tools for identification and recognition of genera and species. This manual should be considered as a teaching aid, rather than a taxonomic treatment of the Class, Fungi Imperfecti. It is a collection of excellent illustrations of 302 recognized genera, with brief descriptions and a key to the genera. The emphasis is placed on common or important genera, although a number of unusual forms are also included. Included in the set of drawings and placed first are nineteen genera of conidial Phycomycetes which are similar to the Moniliales. These are followed by the Moniliales, Sphaeropsidales, Melanconiales and Mycelia Sterilia.

This manual is considered as a great help for the student in general mycology, to a lesser extent in medical mycology, with its outstanding drawings, short but succinct and clear descriptions. The reviewer would particularly underscore the importance of the selected literature attached to every species which is invaluable for the student for his departure in further research. Paper, printing and the reproduction of the drawings are excellent. A list of general references and an index of the Genera is included. This manual will fulfill an important role as an excellent teaching aid.

TIBOR BENEDEK

CIFERRI, R.: *G. Lindau and P. Sydow's Thesaurus Literatura Mycologicae et Lichenologicae Supplementum,* 1911—1930. Vol. 2, E—K. pp. 690—1476. Renzo Cortina, Pavia, Italy.

The second volume of this important bibliography, which appeared in June 1958, includes authors from E through K. References 7168—15295 are listed.

WM. BRIDGE COOKE
Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

CIFERRI, R.: *Manuale di Micologia Medica.* Tomo I, Parte Generale. Casa Editrice Renzo Cortina, Pavia, 1958. 370 pages, 304 figures. Price: L. 5,000.

In this "manual" (a stark understatement!) one of the great masters of Italian Mycology presents a text covering the field of general medical mycology which by its basic concepts and organization of the material, by the overflowing richess of facts (and figures), by its background of general biology in its presentation, by the superior knowledge and use of the world literature, stands out as a unique achievement of the greatest merit.

In ten chapters of this first volume (a second volume should soon follow) after a general introduction which also contains within few pages an outstanding history of medical mycology starting with BASSI, the author systematically covers the morphology, physiology, ecology and geographical distribution of fungi. Another chapter covers the systematic basis of mycology with special view of medical mycology. Technic of the microscopic and cultural investigations follows. A concise chapter is dealing with the serology and immunology relating to fungi. Saprophytism, parasitism and pathogenicity are succinctly discussed. A key to the recognition of human mycoses is given. The last chapter contains the therapy; an excellent introduction for novices how to publish the results of mycological investigations and a closing, extensive bibliography (26 pages!) covering general works, those on specifically pertaining to medical mycology and finally single publications.

This "manual" is much more than its title would permit to guess. In the 304 figures (all original drawings) the author gives us also a determinative key to fungi. Something certainly unique in a medical mycological text. This part of the text is only comparable to LINDAU's Kryptogamenflora für Anfänger. The souverain command of the world literature gives us a well selected bibliography in which not only the Latin language publications, but also the Anglosaxon and German literatures are fully considered. Paper (high stock glossy), the print, the reproduction of the drawings are outstanding. The work is dedicated to the late Professor REDAELLI to whom the author was bound by a friendship and scientific collaboration of thirty years. The text is clearly written with a remarkable ease as very few similar text in the whole world literature. This manual does not need any recommandation, it speaks for itself. It is a unique and ideal introductory text in medical mycology with its broad general biological background. The reviewer hopes and wishes that this text should be translated in English to give medical mycologists (and not only the beginners!) an easy approach to this fundamental publication. We look forward with great interest to the second volume of this work dealing with special medical mycology.

The great Italian master can be sincerely congratulated upon this unique achievement. His erudition, his profound knowledge of general and medical mycology enriched the Italian and the world mycological literature in a most enviable manner.

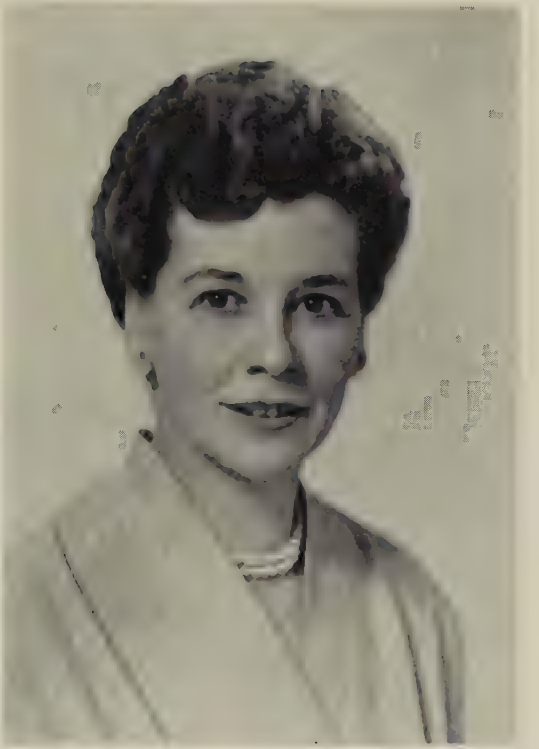
T. Benedek

ANNOUNCEMENT

A new "Middle America Research Unit" sponsored by the National Institute of Health (USA) and the Walter Reed Army Institute of Research, Washington, D.C. was recently established at Balboa Heights, Canal Zone, Panama. The Unit's basic aim is to initiate a long term study of Histoplasmosis, especially in military personnel and their dependents. In addition to Histoplasmosis, the investigations will extend to other "Tropical Diseases" throughout South and Central America, especially those of viral and mycotic etiology. Dr. ALEXIS SHELOKOV is the Director of the Unit as well as of the virologic research activities. Miss CHARLOTTE CAMPBELL is the Chief, Mycology Section, Walter Reed Army Institute of Research and Acting Chief, Mycology Section, MARU. Their address is: Middle America Research Unit, National Institute of Health, Box 2011, Balboa Heights, Canal Zone, Panama.

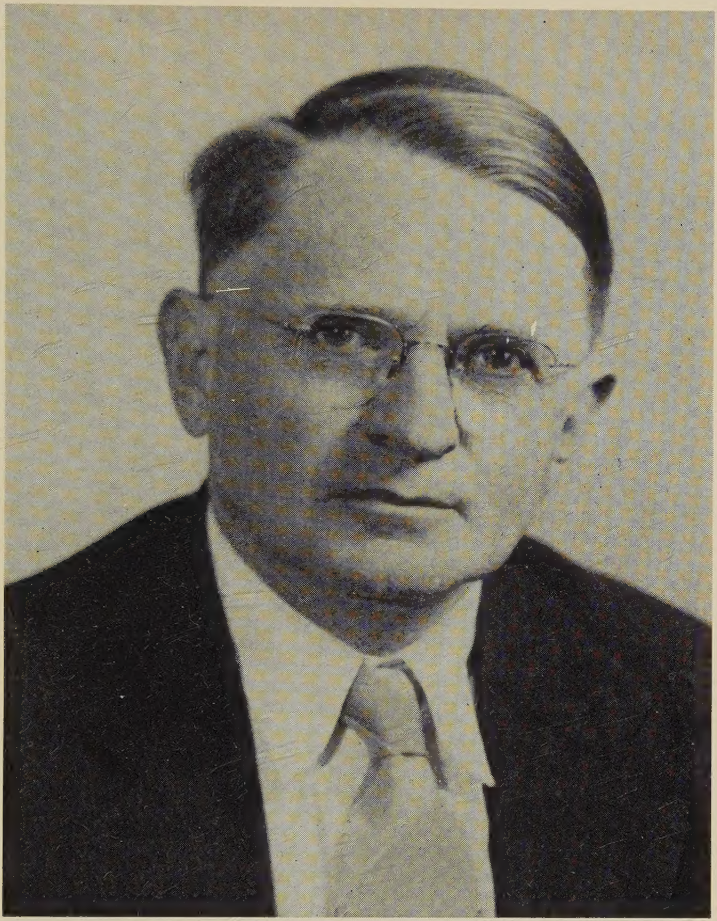
ANNOUNCEMENT

The Editor wants to call the attention of the readers of *Mycopathologia et Mycologia Applicata* to the existence of a "*Review of Medical and Veterinary Mycology*". This journal aimes at surveying the whole field of medical and veterinary mycology with the attempt to notice all important papers. It is issued as a quarterly (March, June, September, December). Annual subscription 25s. post free. Every abstract brings the substance of the paper reviewed. Every issue includes an author and subject index. For quick survey of the world mycological production it can be warmly recommended to every mycologist whatever his special field is. Address: Director, Commonwealth Mycological Institute, Ferry Lane, Kew, Surrey, England.



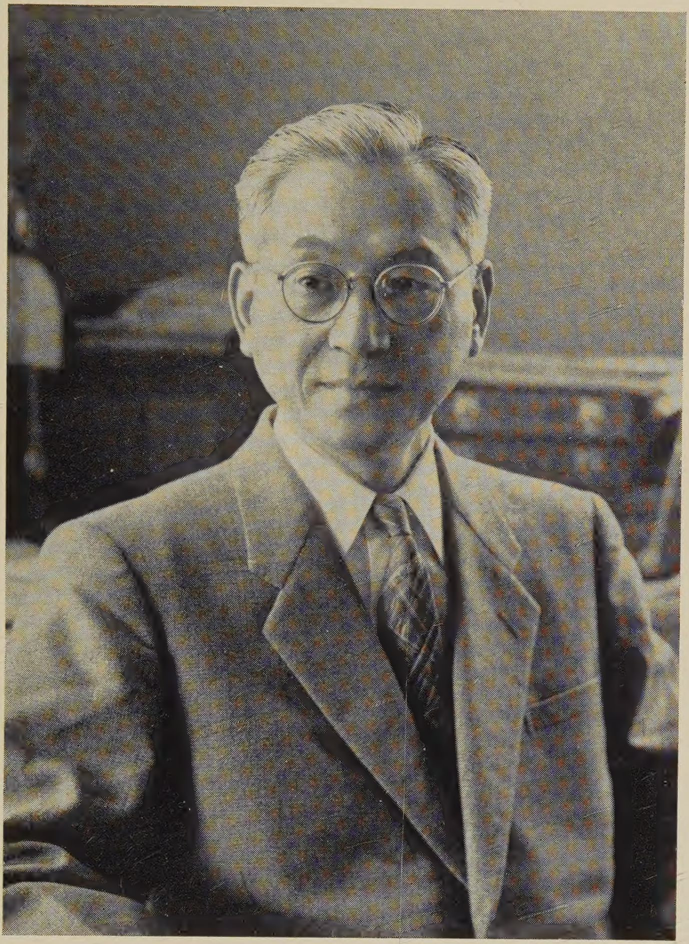
JACQUELINE WALKER
Mycological Reference Laboratory
London School of Hygiene and Tropical Medicine
London, Great Britain

Gallery of Contemporary Noted Mycologists
25



JOHN A. STEVENSON
Curator, National Fungus Collection
U.S. Dept of Agriculture
and
Smithonian Institution
Beltsville, Md., U.S.A.

Gallery of Contemporary Noted Mycologists



YOSHISADA TAKAHASHI
Department of Dermatology
Tohoku University, Sendai, Japan

Gallery of Contemporary Noted Mycologists
28